

Rock & Gem

DECEMBER 2014 | VOL. 44 ISSUE 12

THE EARTH'S TREASURES • MINERALS AND JEWELRY

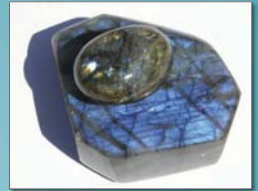
FEATHER RIDGE PLUME Oregon Agate

FIELD TRIP:
**Sandia Mountains
(NM) Travertine**

FOSSILS
**A Snapshot Of
Ancient Life**

PROJECT:
**One Ring,
Many Cabs**

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**A Phosphate
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3-0301	600	75.00	63.75	51.00
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3-0332	600	85.00
3-0333	1200	85.00
3-0334	3000	85.00
3-0335	Set of 4	289.00



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Rock & Gem

Volume 44, Number 12

December 2014

ON THE COVER

Feather Ridge Plume agate comes from a claim in the Strode Basin, Oregon, owned by Philip Stephenson. A single piece may include plumes or blooms in shades of yellow, pink, salmon and white and botryoidal or druzy pockets. (Philip Stephenson photo)

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Printed in U.S.A.

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Rock & Gem (ISSN 0048-8453, USPS 486-290) is published monthly by Beckett Media LLC, 4635 McEwen Rd., Dallas, TX 75244. Periodicals postage paid at Dallas, TX 75260 and at other mailing offices. Printed in U.S.A. Copyright 2014 by Beckett Media LLC. POSTMASTER: Send address changes to Rock & Gem, c/o Beckett Media, 4635 McEwen Rd., Dallas, TX 75244. © 2014 by Beckett Media, LLC. or subscriptions@beckett.com. All rights reserved. Reproduction of any material from this issue in whole or in part is strictly prohibited. Single-copy price \$4.99. Subscription in U.S.A. and possessions: 1 year (12 issues) for \$27.95; 2 years for \$49.95; 3 years for \$66.95. Add \$15.00 per year postage for Canada and all other foreign countries. EDITORIAL CONTACT INFORMATION: rockngem.com

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Benitoite Buzz

I'm writing to congratulate Jim Brace-Thompson on his very fine article in the October *Rock & Gem* about Susie Harlow and her father's "lost" benitoite collection. He certainly put a lot of work into it and it's so well done. He's added significantly to the history of that mineral's collectors and collections in the state. Now everyone can appreciate the stories as well as the specimens. Nice going!

—Jordan Marché
via e-mail



JIM BRACE-THOMPSON PHOTO

Squishy Bands in Agate

I've read a lot about this topic, and many people say that the bands form first as a silica gel, which would be pliable enough (for a long enough time) to account for what look like deformations in the bands, as if they were squeezed out of their regular concentric shape. My question is, if bands are pliable for a certain length of time, then there should be at least a few agates that were cracked by underground pressures when the bands were soft. Then the fracture line should appear soft and squishy. But I've never seen an agate that looked like the bands were pliable or soft when the crack happened. In all the agates I've seen that have cracks that happened during formation, the bands *always* look like they were solid and hard when the crack occurred. I'd happily agree with the gel theory if somebody could show me an agate—just one—where a crack obviously disturbed some pliable bands.

Any thoughts or reactions?

—Tom Noe
via e-mail

I took some time to re-read Schaub's text on silica gel as the source of agates to see if he addressed your question of fractures in agates. He did not. I also reviewed my entire portfolio of agate photos to see what I might note there. I saw nothing that could be identified as a fracture in the deformed banding that would indicate the fracturing occurred while the bands were pliable in any way.

The thought that comes to mind has to do with the plasticity of agates in a confined space. If the agate layers are in any way flexible (squishy), in so confined a space any action that might normally trigger faulting or fracturing is unlikely to happen for the very reason that the agate bands are not completely solid and could flex with the pressure that would normally cause a fracture. They would have to be solid to fracture.

The only cracks I've seen in agates are obviously a result of later stresses and not something that happened during formation. However, that is just an opinion. I'll keep an eye out when handling agates to see if I see anything that supports the idea.

—Bob Jones
Senior Consulting Editor

Show Notice

I received your October issue on Oct. 3, so there was not enough notice for me to attend some shows. Since the list begins with the current month, there's not enough time to plan for some of them, especially folks like me without an RV who have to make motel reservations.

Suggestion: Have a 12-month list of events—not a detailed description, but merely the name, dates of the events and a Web site or phone number—for as far out as events are known, so folks can plan. An alternative would be to supply a central Web site that lists all the events up to 12 months out. The Tucson event date is known a year in advance, as I'm sure others are. If you're a newbie, you don't have that kind of info.

—Paula
via e-mail

You can view the complete list of show dates on our Web site, www.rockngem.com. Please note that we can post only that information which is submitted to us. Due to print deadlines, show dates should be submitted at least three months in advance of the show month for maximum exposure.

—Editor

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LAPIDARY OF THE MONTH

I combined exotic hardwood and gemstones in two pendants for a unique and complementary look. I have a natural modern, mid-century aesthetic, and these pieces speak to that focus. I am a longtime photographer who drew inspiration from artists like Edward Weston, Ansel Adams, and Imogen Cunningham, artists who were known for their emphasis on line and form. My jewelry inspiration comes from Charles Loloma, who also had a modern aesthetic and routinely combined hardwoods with gemstones in his jewelry and belt buckles.

"I chose the tropical hardwood ebony for its dark color, lustrous appearance, and renowned strength. In the first pendant, I used two strips of ebony to frame one solid piece of tiger's-eye. The tiger's-eye was so beautiful that I wanted to make it stand out even more.

"In the second, I used the ebony to balance a very small but beautiful piece of turquoise and then added the small piece of fossil ivory. Turquoise and fossil ivory are a well-known combination in Native American jewelry. Like Charles Loloma, I used them as accent pieces rather than primary pieces.

"For both pieces, I used a band saw to cut the ebony and then a belt sander to shape the edges and get a nice clean and even surface. I left the ebony with straight edges for the first piece and gave shape to the tiger's-eye. For the second piece, I added visual interest to the ebony by sanding the edges down, giving it an angular appearance.

"I used Formby's tung oil finish on all of the ebony, applying several coats over two days. Between coats, I sanded each piece with steel wool. I allowed the wood to cure for 24 to 48 hours before putting in the pendant tray.

"I cut all of the gemstones on a 6-inch trim saw and then used a variety of grinding wheels (starting with an 80 grit and moving to 220 grit) to shape the stones before moving to the 8-inch Ameritool flat lap to refine their sizes and shapes. Because the stones were close in size to what I needed at this point, I started with the 220 grit flat lap sanding disk and moved sequentially to the 3000 grit disk. Along the way, I kept checking for size and fit, tweaking as needed.

"Once I took each stone through the entire cutting, grinding, shaping and polishing process, I gave them one final polish on a tin oxide wheel using a diluted tin oxide paste. I find that, if I've done sufficient polishing along the way, this gives the stones an extra gloss.

"Both pendants are considered 'statement pieces' and garner a lot of attention when worn. They are completely unique and obviously custom, something a lot of people appreciate in this age of mass production. It's fun designing the pendants and great when they come together as planned."

—Abby Hanneman
San Diego, CA



Would you like to be named Lapidary of the Month?

To enter the contest:

- Write a 500-word step-by-step description of how you crafted your lapidary project from start to finish. Save it as a document file.
- Take at least one sharp, close-up, color digital photo of the finished project. Photos must be high-resolution (300 dpi at 4 inches by 5 inches, minimum).
- Attach your document file and digital photo (.tif or .jpg) to an e-mail and send it to editor@rockngem.com with the subject line "Lapidary of the Month".
- Make sure you include your name and street address (not a PO Box)



for prize delivery should your entry be selected for publication. Only winners will be notified. E-mail the editor or call (972) 448-4626 with any questions about these requirements.

Lapidary of the Month winners receive a two-speed Dremel Model 200 N/40 MultiPro kit and a wall plaque in recognition of their creativity and craftsmanship. Winning projects are also posted on our Web site, www.rockngem.com.

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2014/2015

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NOV. 14, 15, 16	TACOMA, WA
NOV. 21, 22, 23	PORTLAND, OR
NOV. 28, 29, 30	RENO, NV
NOV. 29, 30, DEC. 1	MONTEREY, CA
DEC. 5, 6, 7	SANTA BARBARA, CA
DEC. 12, 13, 14	COSTA MESA, CA
DEC. 19, 20, 21	SAN DIEGO, CA
JAN. 2, 3, 4	SANTA ROSA, CA
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Submit show date information at least four months in advance using the electronic form at www.rockngem.com.

DECEMBER 2014

5-7—EL PASO, TEXAS: Annual show; El Paso Mineral & Gem Society; El Maida Auditorium; 6331 Alabama; Fri. 10-6, Sat. 10-6, Sun. 10-5; free admission; gems, minerals, fossils, beads, jewelry, tools, books, equipment, geode cutting, silent auction, raffles, lapidary demonstrations; contact Jeanette Carrillo, 4100 Alameda Ave., El Paso, TX 79905, (877) 533-7153; e-mail: gemcenter@aol.com; Web site: epmgs.com

5-7—SANTA BARBARA, CALIFORNIA: Wholesale and retail show; Gem Faire Inc.; Earl Warren Showgrounds; 3400 Calle Real; Fri. 12-6, Sat. 10-6, Sun. 10-5; adults \$7, children (ages 0-11) free; fine jewelry, gems, beads, crystals, gold and silver, minerals, exhibitors, jewelry repair while you shop, hourly door prizes; contact Yooy Nelson, (503) 252-8300; e-mail: info@gemfaire.com; Web site: www.gemfaire.com

6-7—NASHVILLE, TENNESSEE: Wholesale and retail show; American Bead Shows; Tennessee State Fairground; Smith Ave.; Sat. 10-5, Sun. 10-4; adults \$6 (discount coupon on Web site); antique and vintage jewelry components, beads, freshwater pearls, gemstone beads, Swarovski beads and components, seed beads, beading supplies, carved wood and bone beads, Kumihimo supplies, jewelry and craft tools, finished items; contact Samuel Mbullah, PO Box 490803, Atlanta, GA 30349, (770) 739-0057; e-mail: beadshows@hotmail.com; Web site: <https://americanbeadshows.com>

12-14—COSTA MESA, CALIFORNIA: Wholesale and retail show; Gem Faire Inc.; OC Fair & Event Center; 88 Fair Dr.; Fri. 12-6, Sat. 10-6, Sun. 10-5; adults \$7, children (ages 0-11) free; fine jewelry, gems, beads, crystals, gold and silver, minerals, exhibitors, jewelry repair while you shop, hourly door prizes; contact Yooy Nelson, (503) 252-8300; e-mail: info@gemfaire.com; Web site: www.gemfaire.com

12-14—NORCROSS, GEORGIA: 20th Annual Show; Mammoth Rock Shows LLC; North Atlanta Trade Center; 1700 Jeurgens Ct.; Fri. 10-6, Sat. 10-6, Sun. 10-6; adults \$4 for 3 days, military and law enforcement personnel, students and children free; 50 dealers, minerals, fossils, rough rock, gold and silver findings, tools and lapidary equipment, beads, jewelry creations, loose and mounted precious stones, on-site jewelry repairs, drawings, grand door prize; contact Richard Hightower, 78 Emerald Hill, Franklin, NC 28734, (800) 720-9624; e-mail: staff@mammothrock.com; Web site: www.mammothrock.com

12-14—RIALTO, CALIFORNIA: Show and sale; Orange Belt Gem & Mineral Society; 105 S. Palm Ave.; open field across the street from Rialto City Hall; Fri. 10-5, Sat. 10-5, Sun. 10-3; free admission; fossils, minerals, gems, jewelry, jade, rough rock, polished stones, crystals, opals, crafts, Spinning Wheel, tailgate; contact Ken Gard, 205 W. Benedict, #8, San Bernardino, CA 92408, Workshop (909) 381-0089 or Jessica (909) 887-5507; e-mail: kengard@roadrunner.com; Web site: obmsrocks.yolasite.com

13-14—FRANKLIN, TENNESSEE: Annual show; Mid-Tennessee Gem & Mineral Society; Williamson County AgExpoPark; 4215 Long Ln.; Sat. 9-6, Sun. 10-5; adults \$4, students \$1, children free; demonstrations, exhibits, silent auction, hourly door prizes, grand prize, more than 30 dealers, beads, crystals, geodes, minerals, fossils, rough, cabochons, gemstones, finished jewelry, Native American jewelry, tools, supplies; contact John Stanley, 2828 Donna Hill Dr., Nashville, TN 37214, (615) 885-8704; e-mail: show@mtgms.org; Web site: www.MTGMS.org

19-21—SAN DIEGO, CALIFORNIA: Wholesale and retail show; Gem Faire Inc.; Scottish Rite Center; 1895 Camino del Rio S.; Fri. 12-6, Sat. 10-6, Sun. 10-5; adults \$7, children (ages 0-11) free; fine jewelry, gems, beads, crystals, gold and silver, minerals, exhibitors, jewelry repair while you shop, hourly door prizes; contact Yooy Nelson, (503) 252-8300; e-mail: info@gemfaire.com; Web site: www.gemfaire.com

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9-11—LARGO, FLORIDA: Annual show; Pinellas Geological Society; Largo Cultural Center; 105 Central Park Dr.; Fri. 10-6, Sat. 10-6, Sun. 12-5; adults \$1.50; drawing, silent auction; contact Leona Sheffield, 2440 S. Shore Dr. SE, St. Petersburg, FL 33705, (727) 709-3236; e-mail: nwilk@sjvcc.org

16-18—GLOBE, ARIZONA: 58th Annual Show; Gila County Gem & Mineral Society; Gila County Fairgrounds; 3 miles northeast of junction U.S. 60; Fri. 9-5; adults \$3, students and children free; more than 40 specimen display cases, children's fossil and mineral specimen dig, fossil program; contact Jodi Brewster, (623) 810-9780; Web site: gilagem.com

17-18—EXETER, CALIFORNIA: Annual show; Tule Gem & Mineral Society; Veteran's Memorial Bldg.; 324 N. Kaweah/Hwy. 65; Sat. 10-5, Sun. 10-4; free admission; showcases, dealers, demonstrations, children's activities, near Sequoia National Park; contact Bill Bingaman, PO Box 265, Three Rivers, CA 93271, (559) 741-6381; e-mail: Bandgbing@aol.com; Web site: Tulegem.com

17-18—YACHTS, OREGON: Annual show; Yachats Chamber of Commerce; Yachats Commons; 4th and Hwy. 101; Sat. 10-4, Sun. 10-4; free admission; gemstones, fossils, minerals, jewelry; contact Donna Hirschman, PO Box 550, Yachats, OR 97498, (541) 270-3777; e-mail: iamhrsch@yahoo.com; Web site: www.yachatsagatefestival.com

23-25—TYLER, TEXAS: Annual show; East Texas Gem & Mineral Society; Rose Garden Center; 420 S. Rose Park Dr.; Fri. 9-5, Sat. 10-6, Sun. 10-5; adults \$5, students and children \$1, Scouts in uniform free; dealers, jewelry, gems, minerals, fossils, decorator items, geodes, demonstrations, cabbing, faceting, wire wrapping, silent auction, kids' spinning wheel, fluorescent mineral display, hourly door prizes, grand prizes; contact Keith Harmon, 9116 US Hwy. 84 West, Rusk, TX 75785, (903) 795-3860; e-mail: keithharmon19@yahoo.com

24-25—PANAMA CITY, FLORIDA: Annual show; Panama City Gem & Mineral Society; Central Panhandle Fairgrounds; 2230 E. 15th St.; Sat. 9-5, Sun. 9-4; free admission; hourly silent auctions, door prizes, grand prize; contact Steven Shipton, 5113 E. 13th Ct., Panama City, FL 32404, (850) 867-0586; e-mail: shipton3@comcast.net

JANUARY-FEBRUARY 2015

29-15—TUCSON, ARIZONA: Wholesale and retail show; Eons Expos; 22nd Street Mega-Tent; 600 W. 22nd St.; daily 9-6; free admission; meet the cast of the TV show "Prospectors"; who will be at the show selling their finds; contact Heather Grana, 235 First St., Keyport, NJ 07735; e-mail: Heather@EonsExpos.com; Web site: www.EonsExpos.com

30-15—TUCSON, ARIZONA: Annual show; Marana Miner's Co-op; The Rock Show; 6107 N. Travel Center Dr.; daily 9-6; free admission; www.facebook.com/pages/Tucson-Miners-Co-op-The-Rock-Show/313811585410623?ref=hl; contact Rachel Ford-Dingfield, (720) 495-8362; e-mail: kaipuravida@gmail.com; Web site: <http://tucsonrockgemmineralshow.com/>

FEBRUARY 2015

7-8—MERRITT ISLAND, FLORIDA: Annual show; Central Brevard Rock & Gem Club; Kiwanis Recreation Center; 951 Kiwanis Island Park Rd.; Sat. 10-5, Sun. 10-5; adults \$5 (\$1 off coupon on Web site), children free with adult; more than 20 dealers, lapidary tools, rocks, slabs, minerals, specimens, hand-made jewelry, beads, cabochons, demonstrations by club members, sluice, kids' activities; contact Roz Mestre, (321) 431-0159; e-mail: roz.mestre@att.net; Web site: www.centralbrevardgems.org

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FEATHER RIDGE Plume Agate

A New/Old Discovery in the Owyhee Desert

Story by Philip Stephenson/Photos by Philip Stephenson
and Linda Stephenson

Feather Ridge Plume agate is a new/old discovery. It was originally discovered by my good friend Jake Jacobitz and his wife, Beverly, in the early 1980s. Feather Ridge was Jake and Bev's "Secret Spot", where they'd camp out, surface collect, and do some light hand digging. Throughout the years, they kept it a secret. Only two of their other friends, Hans Gamma and Gene Mueller, knew something about this beautiful pink plume.

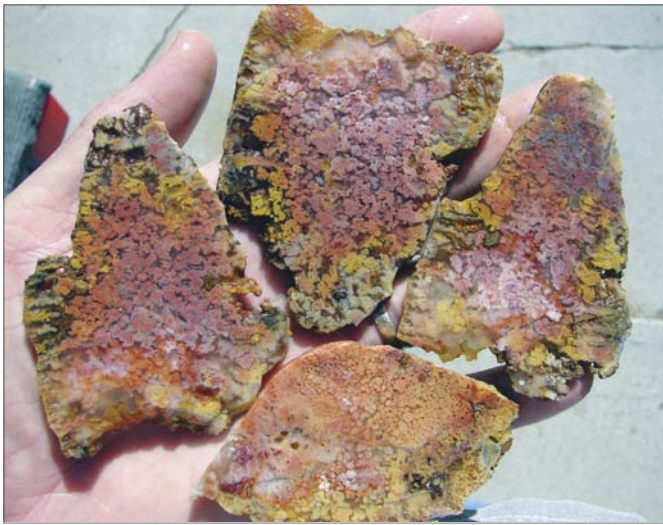
Jake, like all of us, eventually came to a point in his life when he realized that he couldn't do the things he did when he was younger. This realization led him to contact me.

For a few years now, Jake had known I was looking for a claim of my own. Sitting by the campfire after those hard days of digging at the Regency Rose Claim, Jake, Gene and I would shoot the breeze. In those conversations, I related that, if I was ever going to have a claim of my own, it would really have to be worthwhile. Kinda like a first-time deer hunter, I wasn't looking to bag any old deer. I was waiting for that trophy buck to wander into my sights.

Experiences I'd had digging with Jake and Gene at Gene's Regency Rose Claim over the past two years had given me a new prospective and revitalized my interests in dealing rough rock, but I have to admit that I was starting to get burned out. I'd been selling rough every month for seven years on my Web site, and



Multicolor plumes extend up through the clear botryoidal agate in this piece of Feather Ridge plume agate.



Angel wing chalcedony has a formation characterized by groups of chalcedony filaments, often intricately woven together or connected.



Spheres are then fused together to form the botryoidal cluster. Having plumes form right up into the spheres or spires is somewhat rare, but not at Feather Ridge

on average I take more than 800 pictures for every sale, so that's 67,200 pictures so far that I have edited, resized and uploaded of just rocks. I needed something else.

Jake phoned me back in March 2012, saying he and Bev had talked it over and wanted to know if I was interested in looking at, and perhaps claiming, a pink plume deposit they discovered years ago. He said it might be the "trophy buck" I'd been waiting for.

I set a date for the two of us to go out and look at the ground where the pink plume was located. I was on my way to Jake and Bev's house. Turning onto their street, I saw Jake sitting in his garage, grinding away at his cab machine.

Driving up, I rolled down my window and shouted, "Hey! Old-timer! Yeah, you with the funny looking hat! I heard you got some rock."

Without skipping a beat, Jake said, "We don't sell yard rock here, fella, try eBay!" We had a good laugh.

I got out of my car and walked over to him. "What ya working on?" I asked.

Jake replied, "Oh, just thought you might want to see what the pink plume looks like cabbled."

I looked down at the dop stick he was holding and my eyeballs almost fell out of their sockets. I said "Holy crap! You're kidding, right?"

"No, no," he said, "that's the real deal. I've been calling it Feather Ridge."

The cab had bright-pink plumes in clear agate, backed with black basenite. Beautiful. My brain started clicking away at all the possibilities. Jake invited me in, bringing me back to reality.

As was customary, Bev, Jake and I sat around the kitchen table and did some catching up. Bev started sharing some funny stories of the times when they had gone out to Feather Ridge. Jake reached back from his chair and pulled a specimen off his display cabinet. It's a polished botryoidal with pink plumes going up into the grape-like agate formations.



The excavator can accidentally destroy good veins, so taking the time to coax the agate out with a hammer and chisel is sometimes the only option.

Jake said, "Here's one Bev found years ago out there on the surface." Being a specimen guy, I get excited over this kind of thing.

One of the many stories I liked was about Jake and Bev camping out there. Jake was taking a bath in the cow-watering tank, which they filled every day from a small stream about 200 yards from the campsite, when a truck pulled up and a woman asked Jake for directions.

Jake started laughing. "There I was, standing with just my underwear and my boots on, giving this woman directions in the middle of nowhere!"

The next morning, Bev said, they were sleeping in their tent when she heard a heavy breathing noise. Thinking it was just Jake, she ignored it. Then a few seconds later, she heard it again. She rose from her sleeping bag

to find a cow poking its head into the tent, staring at her and chewing its cud.

Jake and I said our goodbyes to Bev and headed on out to the Owyhee Desert. The plume site is located in the Strode Basin, which is about 10 miles southeast of the Regency Rose claim and roughly 800 yards from the Oregon-Idaho border.

While driving over some rough dirt roads, Jake pointed out different sites he had dug in years ago. We drove to the top of a small hill. Stopping the truck and looking about, I said, chuckling, "What the hell is that?"

Jake explained that it was his coffee mug. It's a rusty old coffee can with a plastic bottle in the center. The bottle is surrounded with spray insulation foam. "Works like a charm", he said.

I asked, "When was the last time you cleaned the damn thing?"



I owe Jake Jacobitz (left) and his wife, Beverly, for fulfilling my dream of owning a mining claim.



A color mass mixes shades of pink, salmon, yellow and orange.

Jake very seriously said, "Oh, no—ya never clean a man's coffee cup. That's what makes the coffee taste good."

We got out of the car, and on the ground were bits of pink plume here and there. It's really hard to believe that rockhounds have not found this site. It's right off the main dirt road, on top of a small hill, for all to see. Just looking around on the surface, I see small chunks of agate with colored plumes, mainly pink, but also yellow and white. I collected some to take home and cut, but it all looked great to me. Jake showed me different areas in which they had hand dug and suggested other places to dig if I were to claim it. (Jake had never staked a claim.) To make a long story short, I made my first claim on the "trophy buck". A few weeks later, Jake helped me put up the stakes.

I needed to make a mining plan for the BLM. Since this was all new to me, I needed a little help. Jake and Gene gave me great information on writing up a plan. The plan was approved quickly by the BLM, without any hiccups. In addition, Jake and Gene advised me to keep all of this under my hat 'til a few weeks before I started officially digging. Once you stake an official claim with the BLM, it's public record. Then, everyone and their brother will know where it is. I didn't want some boneheads in there digging up the place with picks and shovels. So the last two months leading up to start of excavating were pure hell!

A MINER'S DIARY

Sept. 10, 2012: The day is here—finally! Jake and I drove the 315 CAT Excavator six miles up and down the rough dirt back roads on the Idaho side and cross the border into Oregon. Man! It's dusty. Fine dust coats the roads and billows up into our teeth, ears, hair and noses. It takes 2½ hours to drive in the excavator, but we make it with no mishaps.

We set up camp just below the digging site. What a beautiful view from the camp looking out towards the Owyhee Desert! The camp is facing due east, with our backs to the west. We should see some magnificent sunrises and sunsets in the weeks to come.

Sept. 10, 2012: This morning, Jake mentions that we need to clean the excavator's air filter out before we get started. We open the air cleaner compartment and find dust caked around the filter. We remove the filter and start shaking and beating it. Dust pours out of it, like you opened a bag of fine flour and threw it in the air. We put the filter back in, start her up, and she purrs like a kitten—well, maybe a tiger.

We break ground with my wife, Linda, recording the event. The first scoop hits pay dirt: As the bucket's teeth dig into the basalt, we hear that familiar high-pitched squeal of steel scraping against agate. Looking down into the hole as the bucket pulls out, I see fine flakes of pink and white. It's going to be a good first day.

Sept. 13, 2012: The dig progresses to the point where we are running out of buckets. Just in three days, we haul out 10 buckets of beautiful pink plume. Many chunks weigh up to 40 pounds. Percentage-wise, I believe we have around 95% pink plume, 3% yellow and 2% white. If this keeps up, I'll need to call some friends to bring me some more buckets. We end up putting it all in a big pile until more buckets arrive.

Sept. 14, 2012: We are blessed: The basalt is fractured, so all we need to do is to rip it down. The veins are (relatively) easy to get out. At times, we do come across a super nice vein or seam. Not to chance damaging the agate, we then use muscle to pry it out. Once we see the uncovered agate, it was then a judgment call: use the excavator bucket teeth or a hammer and chisel. Most of the time the bucket is all we need.



The basalt was fractured, so all we needed to do was rip it down with the excavator bucket.

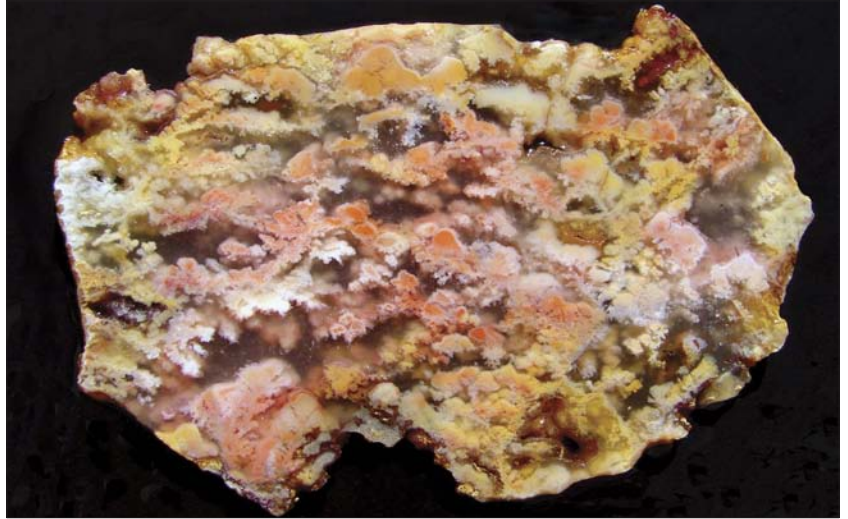
The mornings and days' ends become a ritual. We wake up with the sunrise just coming over the lava plateaus and get up slowly, not on purpose, but out of necessity; joints and muscles that are sore from hammering and lifting need to warm up to the requested impulses from the brain. I reach for a clean shirt, clean underwear, sunscreen and Advil. Grabbing from the pile of dirty clothes, I put on the same pants I had on the day before. I then put on my dusty, salt-encrusted hat.

Then the hacking begins, as the dust settled in my nose and lungs gets blown out. We have a small breakfast and coffee (in my case, tea). Then, strapping on the shin guards like armor, we are ready to do battle. Working down in the pit, it feels about 10° hotter, since there is no wind flowing into the hole.

We know it's getting near quitting time when the flies come out and start to buzz in our faces and land on our noses, mouths and eyes. The flies are different out there. I call them "cow flies" because they are so used to landing on cows' eyes and noses without getting slapped. We shut down the machine and make the slow walk down to the camp. Being tired from the work and heat, not much is said.



This piece of plume agate was hand dug before excavating.



Blooms are plumes whose structure resembles a single blooming flower, and may occur in small groupings.



It took 2½ hours to drive the excavator six miles down rough dirt roads across the border into Oregon.

We wash off the dust, dirt and grime and replace our shirts with clean ones. Dinner gets heated up. Bottles of water and Gatorade are consumed. Jake sits in his chair, looking out over the Owyhees, munching on his bag of Cheetos. We each cook our own food and have our own “kitchens” (propane stove and can opener). Dinner for me varies: T-bone steak, large can of soup, sandwich, etc. Jake’s, on the other hand, is a can of chili or a can of chili with raw peppers or a can of chili with fruit or a can of chili with bread. I’ll never forget one of Jake’s astute proverbs: “It’s a great day when a man can fart in his own kitchen and not get hell for it”.

Days and nights with Jake were priceless. Jake is very quick witted and always seems to be full of humorous quips and anecdotes. At night, we often sat discussing not only rocks, but other things. I found his uncomplicated views of life quite refreshing, as well as thought provoking. That is something I’ll talk about and share with others for the rest of my life.

One of the things that almost always happens, once everyone knows you are digging, is that you get visitors (tourists). I don’t mind tourists. Hell, I used to be one myself. Most of the “tourists” were my friends or people

Feather Ridge Agate Patterns

Compared to other well-known plume agates, some of the patterns in the Feather Ridge material are different and some similar.

Plumes: Treelike or featherlike structures in singles or in groups. Main colors: pinks, salmon, yellow, white and orange.

Blooms: These are also plumes, but with a different structure, resembling a single blooming flower, sometimes in small groupings. Main colors: pinks, salmon, yellow, white and orange.

Bouquet: A mass of single blooms, usually smaller ones grouped together. Main colors: pinks, salmon, yellow, white and orange.

Color mass: A mass of color has plumes and blooms that are not quite defined, but the color combinations are still very beautiful. Main colors: pinks, salmon, yellow, white and orange.

Opal: Very common at Feather Ridge, most of the time in very large and thick veins. In general, it does have very nice plumes, which are typically located on the edge of the huge (5 to 6 inches wide, several feet long, and a few feet deep) veins. The agate “plume line” within the veins is about 1 to 3 inches wide, and the rest of the vein is solid gem opal. Like most opal, it can be brittle. Main colors: yellow, white, pink, red, salmon and orange.

Druzy: A coating of fine crystals in pockets within the agate. They look fantastic when incorporated into a cab, but the pockets are small enough to work around. Lately, the druzy has been very desirable with cab makers and buyers.

Botryoidal: A globular external form resembling a bunch of grapes, or spires on or inside the agate seam or vein. Spheres are fused together to form the botryoidal cluster. Botryoidal pockets look fantastic when incorporated into a cab, but the pockets are small enough to work around. Having plumes form right up into the spheres or spires is somewhat rare in most plume agate deposits, but not at Feather Ridge. It’s very common to see plumes of pink, white, yellow and orange that have formed all the way up into these structures. They make magnificent, high-dollar display pieces.

Angel Wing: The term “angel wing chalcedony” refers to a delicate chalcedony formation that is characterized by groups of chalcedony filaments, often intricately interwoven or connected. They occur most often in the center of a vein or vug of agate. Having the plumes form right up into the angel wing is, again, somewhat rare in most deposits, but not at Feather Ridge. It’s very common to see plumes of pink, white, yellow and orange having formed all the way up into these structures. They make magnificent high-dollar display pieces.



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FEATHER RIDGE Plume Agate from page 15



Cabochon makers find tree- or featherlike plume structures in singles or in groups the most desirable patterns.

from the rock club, coming out to see what we had dug up. Typically, this is a good thing. They come all the way out just to see you and share in the excitement.

When they arrive, I point out where the claim posts are located and let them explore. There's no way to stop them from picking up the crumbs left behind after we leave, so I try to minimize the damage they can do. I ask them not to walk on or dig through the "corn rows" we make after filling the pit. This scarification is done in order to minimize erosion and to make a place for topsoil to become trapped and congregate to promote plant growth.

After two long weeks of hard work, heat and dust, we are ready to close the pit. Now that I have seen the trends in the ground, I am already planning for a future dig.

Jake and I agree that the best rock to go after next time is right under the huge pile of muck (waste rock/tailings) that we've been dumping off to the side. We mark off the boundaries of the pit on the surface and start moving the muck back into the hole.

It's amazing the amount of material that goes unseen when it is scraped up by the bucket. Before we get started, we each take a bucket and go through the tailings pile. Before long, the buckets get filled up. Then we move some more muck, stop, and do it over again. After the hole was filled, I believe we had at least five buckets of missed tailings.

The last day, we do the scarification, break camp, and then drive the excavator the 2½ hours back down the rough, dusty dirt road.

I want to thank Jake and Beverly for fulfilling my dream of owning a claim. Feather Ridge Plume has the potential to become a great classic, but only time will tell. Jake and Beverly's names will forever be attached to Feather Ridge. I felt it an honor to be associated with them and Feather Ridge Plume.

EVALUATING ROUGH

The rock buckets are back home, covering the back driveway. Now, it's time to wash, clean, sort and evaluate the rough. This will take time, since I have a good deal of rock to process. The whole endeavor was not cheap. Jake says mining is quite different from the old days, when you borrowed a backhoe and started digging. Rental of the excavator for two weeks came close to \$5,000. Add to that the cost of diesel fuel—which, during the time we were there, was at the highest cost per gallon all year—food, gas, insurance, BLM bonding, etc., and the cost of doing business is high. As Jake says, "The days of going down to Quartzsite and selling/buying good rough at a dollar a pound is long gone".

I have spent my first week home nursing sore muscles and cleaning rock. I have also cut some rough, and the results have been excellent. I'm noticing some trends in the patterns and colors.

The quality is excellent, with very little—if any—single fracturing. Any fractures I do encounter would be due to the mining process and not necessarily the rough itself. I have not seen any spider fractures in the rough I have cut so far. Looking at the rough, I would not expect any at all.

The colors are bright and lasting. Sometimes, as rough begins to dry out, it can change color or density or both. Not so here. Everything is staying consistent.

The rough does contain small pockets of fine druzy crystals, along with some botryoidal pockets, which look fantastic when incorporated into a cab. The pockets of both are small enough to work around, if druzy or botryoidal are not your bag.

As I start cutting the rough more, I'll be posting some of my "keepers" on my Web site, www.RareRocksAndGems.com. 💎

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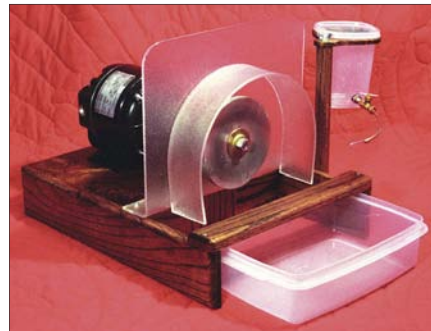
S HOP TALK

by William A. Kappela

Building Lapidary Machines

After 20 years, ShopTalk columnist Bill Kappela is hanging up his keyboard to spend more time at his lapidary bench. *Rock & Gem* and its readers extend their thanks to Bill for his years of informative and entertaining writing.

—Editor



Over the years, I have written several times about building your own lapidary machines, but the subject never seems to get old. The first big question is, why would anyone want to take on such a seemingly difficult task when there are so many fine commercially made machines out there? There are several answers to this.

The No. 1 reason is usually financial. Although machines come in a wide range of prices, even the low-end ones can sometimes be rather pricey—especially if Emily needs braces or Charlie needs glasses.

Another reason is an affliction that I suffer from: the “I can make one of those for a lot less money” syndrome. This may be the route to take if you are financially strapped, but if you really can afford a new machine, maybe you could be using the time you would have spent making a cabber actually making cabs.

Finally, if you really think you can make a better machine than one you can buy, go for it. If it works out, you will be happy, and maybe you'll patent your design.

I have noticed that many people are afraid that they are not capable of building a machine. In most cases, this is not true. Many folks say that they are not mechanically inclined, when they are simply more inclined to watch football. The most important inclination is desire.


For example, let's say you really want to build your own disk-style cabbings machine that will grind, sand and polish. You can do so with a couple of screwdrivers, a couple of crescent wrenches, and a drill with an assortment of bits. Most of this stuff is even lying around the houses of those who don't think of themselves as do-it-yourselfers.

The most important tool you can have, though, may be the Internet. With Google, Bing, Yahoo, or (if you don't want your browsing tracked) Duck Duck Go, you can find parts, arbors, motors, photos of commercial and homemade machines, and plans for a number of different machines. In addition, on YouTube you can find videos of people making and using machines.

Even though you may be thinking of making your own machine(s), don't overlook the

manufacturers. Send for their catalogs or look up their sites on the Internet. They have nice photos and descriptions of all of their stuff. You will get an idea of what is available, how it is configured, and what parts and accessories you might need for your machine. Sometimes, these manufacturers sell parts, and some even sell kits. The last time I checked, Covington Engineering sold saw kits. It might be worth checking out.

However you build your own machine—whether it is from parts you have scrounged up or from shiny new parts you bought—you will experience a great feeling when you see the first cab you have made on a machine that you made yourself. Here are a few Internet sites to whet your appetite:

- www.roughrocks.co.uk/our-home-made-cabachon-machine/
- <http://andy321.proboards.com/thread/31278>
- <http://andy321.proboards.com/thread/25934>
- <http://andy321.proboards.com/thread/21952>
- <http://andy321.proboards.com/thread/22464?page=1>
- <http://silverandstone.wordpress.com/2011/01/13/lapidary-tips-diy-inexpensive-lapidary-grinder/>
- <http://andy321.proboards.com/thread/42508>
- www.youtube.com/watch?v=hOanT8U8N4I
- www.metacafe.com/videos_about/lapidary_equipment/
- <http://home.earthlink.net/~jmcdothsd/> 

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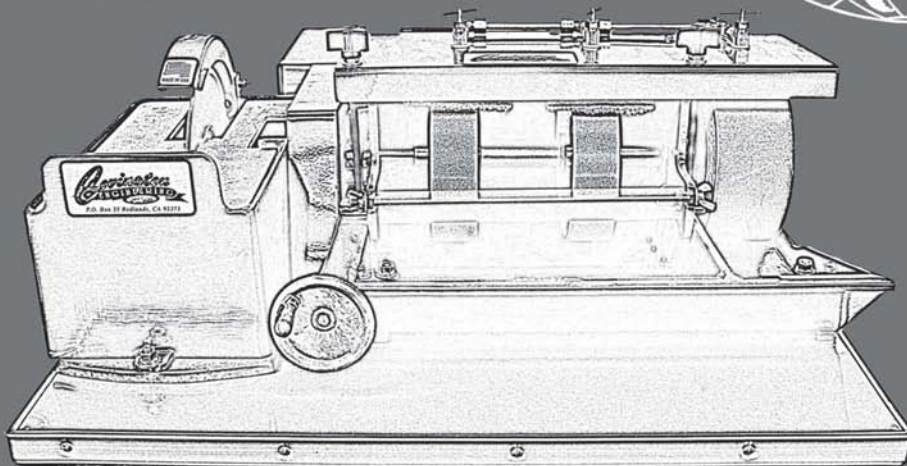
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The Apatite MINERAL GROUP

Story by Bob Jones

Their Hexagonal Forms Are Deceptive

Make no bones about

it: Apatite is a very common mineral. In fact, without it you would be a pile of human jelly because your bones are basically apatite! Even your teeth would not survive. Bones and teeth depend largely on the mineral chlorapatite for their structure. There's more to it than that, but apatite is a very important phosphate ingredient of your skeleton and teeth.



The yellow color of chlorapatite crystals from Mexico is due to included traces of the rare earth elements neodymium and praseodymium.

Apatite is not the name of a specific mineral, but of a group of three minerals: fluorapatite, chlorapatite and hydroxylapatite. There are a couple of other apatite names, such as manganapatite, that old-timers like

me use, but which are no longer recognized by the powers that be.

The Greeks called apatite "the deceiver" because it looks so much like vanadinite, pyromorphite, and a dozen other hexago-



This specimen of gemmy, pink fluorapatite on muscovite from the muscovite locality in the Hunza Valley (Gilgit District) of Pakistan measures 7.6 cm by 6.2 cm by 4.6 cm.

nal minerals. The chemical names we have known and used for decades—fluorapatite, chlorapatite and hydroxylapatite—are also deceiving, because they are no longer valid names in the most recent literature.

You may have noticed that a number of mineral names now sport a suffix of chemical symbols. Such is the case of these three common apatites. The most common member of the group, fluorapatite is now called apatite (Ca_5F). The next most common member, chlorapatite, is now apatite (Ca_5Cl). The third member, hydroxylapatite, is now known as apatite (Ca_5OH). Adding to the confusion is that these three species are not even considered to be a group anymore. Under the new designations, they are considered separate species, not members of a group. For this discussion, however, I'll stick to the old-school names and grouping!

The general chemical name for apatite is calcium, chlorine, fluorine, hydroxyl phosphate. The three central ingredients can interchange, with one or two becoming dominant in the chemistry of a given specimen. You can see this in the names cited above. Remember the old method of using a triangle to explain chemical relationships? These three species fit that design perfectly, since chlorine, fluorine, and the hydroxyl radical can be placed at the corners of the triangle, and the lines in between represent mixtures of two of the corner components.

Of the three types of apatite, the most common member for mineral collectors, and the one that provides us with showy display specimens, is fluorapatite. It also happens to be the species found at one of my favorite Mexican mines, Cerro Mercado.

Listing all the localities in which collectible apatite has been found—granite pegmatites, marble, metalliferous ore veins, and alpine occurrences—would take a small book. Pegmatite deposits yield primarily fluorapatite, since fluorine is a common volatile element in the final fluids from which a pegmatite forms. The other apatites might also show up, but rarely.

Ore veins offer a variety of apatites, depending on the composition of the fluids from which the ores formed, though fluorapatite seems to be the most common. The plethora of apatite crystals found in the marbles of Canada have not all been identified, but those that have are chlorapatite.

Undoubtedly, the counties in Quebec could produce a great number of apatite crystals if they were mined. They have already been prolific. But from personal experience, I would have to say the one locality that has produced the greatest number of apatite crystals has to be Cerro de Mercado (Durango), Mexico.

Years ago, I made an extended trip into Mexico with Bill Panczner, then-Curator of Minerals at the Sonora Desert Museum, and our sons, Chris and Evan. We visited a number of mines, including Cerro de Mercado. Bill was gathering information for his book *Minerals of Mexico* (Van Nostrand Reinhold, 1986), and I was gathering information for future *Rock & Gem* articles.

When we arrived at Cerro de Mercado, we were astounded by the myriad fine, yellow apatite crystals that were there for the taking. There were crystals all over the ground and lying loose in the gravels on the side of the dirt road, and the dumps were replete with yellow prisms. No mat-



This odd apatite from Minas Gerais, Brazil, is made up of both chlorapatite and fluorapatite crystals.



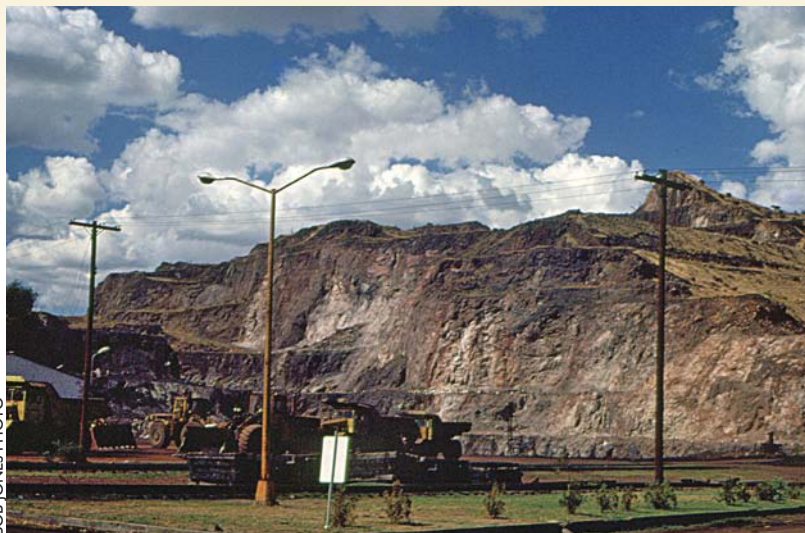
These unusual freestanding, steely-blue fluorapatites, with corrugated edge faces, on matrix are from the Emmons Quarry (Oxford County) in Maine.

ter where you looked, there were gemmy-looking, yellow crystals flashing back at you, none of them on matrix. We stopped to take photos at the main entrance to the mine and we were able to collect as many yellow apatite crystals as we wanted.



VASSIL PHOTO VIA WIKIMEDIA COMMONS

Fine, purple crystals of the common mineral fluorapatite can be found in Afghanistan.



BOB JONES PHOTO

Editor Bob Jones took this photo of the iron mine on Cerro Mercado (Durango), Mexico, while collecting yellow chlorapatite crystals.

Matrix specimens at Cerro de Mercado are rare for two reasons: The ore veins were blasted to break up the rock and get at the magnetite iron ore. The apatite crystals were locked in the ore, but very loosely attached to the matrix, so blasting shook them loose. The gems had formed in pockets filled mainly with a white, clayey material that gave the crystals virtually no support. If you collected a matrix specimen, you would eventually have to apply glue to keep it together. Luckily, the clay did cushion the crystals, so blasting did not shatter all the little yellow hexagons.

On this same Mexico trip, we had a Mexican dealer as a guide. He lived near Cerro de Mercado, and at his place we saw wooden dynamite boxes overflowing with loose yellow apatite crystals, from which we could help ourselves! We picked out a handful of gemmy crystals, all of which were at least an inch long, though a few approached 4 inches in length. The yellow color of these crystals, chemically chlorapatite, is due to included traces of the rare earth elements neodymium and praseodymium.

My initial introduction to pegmatite apatite came when I was working on my master's thesis, titled "Luminescent Minerals of Connecticut", in the 1950s. I spent days and days—actually night after night—in the many pegmatite quarries of Connecticut documenting anything that showed a fluorescent response. One orange-fluorescing mineral I always encountered was commonly called "manganapatite", a name that is now discontinued. Its clustered, small individual crystals occurred embedded in feldspar. Their natural color range is brown to greenish. Freestanding crystals of managnapatite did not exist in the Connecticut pegmatites I checked.



BOB JONES PHOTO/JONES COLLECTION

This delightful example of fluorapatite from the Barroca Grande mine, near Panasqueira, Portugal, sits on a nest of cookeite and ferberite.

Maine is famous for its beautiful violet-hued fluorapatite crystals. These are the darlings of the apatite world here in the United States. They are prized by collectors for their intense violet color, perfect crystal forms, and rarity. The marvelous pink fluorapatite crystals from Pakistan are much larger and are certainly beautiful, but the mystique of Maine purple apatite makes it a classic.

The earliest reports on Maine apatite date to the late 1800s, but the marvelous rockhound story of Maine apatite involves my friend Terry Szenics. We called him "Skippy" when he was a teenager. He had seen the Smithsonian's famous Washington Roebling purple apatite from Maine, and determined to dig in the Maine pegmatites to find something like that.

Teaming up with Frank Perham, who was famous for his Maine pegmatite digs, the teen tackled the Pulsifer quarry on Mount Apatite, near Auburn, in 1966. Their digging carried over into 1967 and was exceedingly

successful; they found a number of superb, small, vibrant, deep-purple fluorapatite crystals.

I ran into Terry later in 1967 at a show in New Jersey. He wanted to show me something, so we walked out to his car, where he pulled out a cigar box full of carefully wrapped specimens of gorgeous purple fluorapatite crystals on matrix. I've often wondered where all those fine crystals are now.

Another apatite that comes to mind is one I saw in the Mark Chance Bandy collection. Mark was the chief mining engineer at the Siglo XX mine in Llallagua, Bolivia, for some 20 years. Mark was so well liked by the miners at Llallagua that, when they went on strike and held the office staff captive underground, they chose him as their spokesman and let him go to work out the negotiations.

When Mark retired, he and his wife, Jean, moved to Wickenburg, Arizona, where I got to know them. He had a marvelous collection, gathered through years of trades with museums and advanced collectors. One specimen he had personally collected was a superb fluorapatite from Llallagua. The piece was a single tabular, hexagonal fluorapatite crystal with another minor crystal attached, but no matrix. The crystal is about 2 inches across and highly modified, and under the ultraviolet lamp, it glows a marvelous pink. The specimen is now in the L.A. County Museum. Today, some mineral dealers are working diligently to obtain minerals from the mines of Bolivia, including Siglo XX fluorapatite.

Tabular apatite crystals are not as common as hexagonal prisms, which are found all over the world. Another noteworthy tabular crystal I've seen resides in a drawer in the main gallery of the Natural History



Brazil still surprises us with amazing finds like this colorful fluorapatite from São Geraldo do Baixo (Doce Valley, Minas Gerais).



Several townships in Canada have deposits of marble that produce large, often slightly rounded prisms of fluorapatite a foot long and over.



Many of the fine fluorapatite crystals that were found in Canada have had to be chipped out of the enclosing orange calcite.

Museum, London. The specimen is from the Knappenwand mine at Untersulzbachtal, Austria. This deposit is world famous for the fantastic epidote specimens it produced for decades. These epidote crystals rank among the finest ever found. Associated with the epidote crystals are hair-like byssolite and, less often, superb tabular fluorapatite crystals.

When dug out of the ground, these apatites are a delicate pink, but that color is lost after brief exposure to strong light. That explains why the Natural History Museum's specimen is stored in a drawer. The tabular apatite crystals found with the gold ores of Morro Velho, Brazil, also show this lovely pink color that fades over time with exposure to strong light.

Fine fluorapatite crystals were undoubtedly encountered by the Romans when they worked the tin deposits of the Panasqueira Mountains in Portugal. During World War I, one ancient Roman deposit became known as the Barroca Grande mine. Today, it is known as one of the great sources of fluorapatite, as well as a source of superb quartz crystals, fine ferberite crystals, bright arsenopyrite crystals, and lustrous, black cassiterite crystals.

Not much is coming out of this region today, but 30 years ago, superb specimens of these minerals were common fare at shows. They were costly even then, as the choice specimens were those with three and four fine examples of Panasqueira species on a single piece.

The apatite from Portugal comes in two types: prismatic and tabular. The bicolor,

prismatic crystals are heavily striated. The tabular crystals are also color zoned, from a lovely pink to green. Some of these tabular crystals can be 4 inches across, but most are in the 1-inch range. Nothing is coming from here today, but because Panasqueira specimens are so fine, when one does reach the market from an old collection, the average collector can't afford it.

When the metal mines of Germany, particularly in the Saxony region, were operating, fine, small, violet-colored apatite crystals were sometimes found. These mines are no longer active, so any old locality specimens are a rarity in the market today. If you see one, be sure to get it, as it is a real classic.

With few exceptions, there is little expectation that any of the older sources of apatite will surge to the fore again. The exception could be the Grenville marbles in Canada, but most of the crystals found there are nongem and not considered what might be called "ikons", crystals everyone wants. Pegmatites, particularly in Pakistan, will produce an occasional fine apatite. And there is always Brazil, which still surprises us with amazing finds.

The Sapo pegmatite mine, in the Ferruginha district of Minas Gerais, has not only produced some amazing apatite, but has outdone itself with its chemically interesting apatite crystals. How the Sapo deposit was found is interesting. A farmer noticed some bits of gem tourmaline mixed in with the gravels of an ant mound, signaling the existence of a deposit below. The mine was opened in 1985, and since then it has pro-

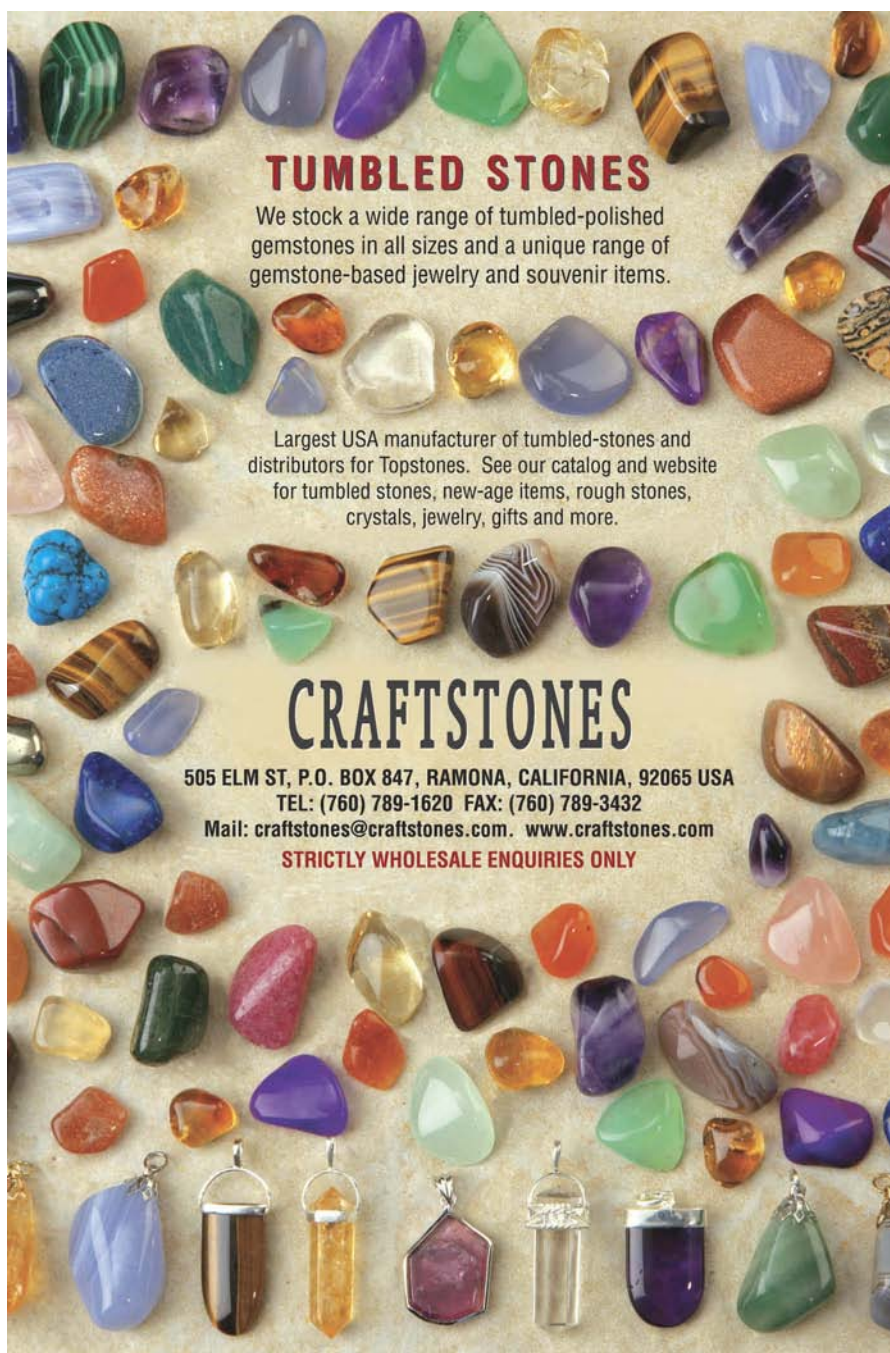
duced huge quartz crystals in addition to feldspar. As mining continued, it began producing several types of apatite crystals, the likes of which had never been seen before from a single deposit.

Of the several forms of apatite found here, the most unusual type is the long stacks of small, green crystals that curve and bend to form spectacular specimens. Curiously, tests have shown these snake-like stacks of apatite to consist of both fluorapatite and chlorapatite! Any given specimen is made up of alternating fluorapatite and chlorapatite crystals. To top it off, many of these weird stacks boast hollow centers.

The Sapo mine has also produced zone crystals of disklike form, which are now considered among the best ever found. These crystals exhibit two shades of green. The larger crystals actually approach a foot across! Such a variety of crystal forms in one deposit is unique, and we have to wonder what surprises this mine has for us in the future.

If you are interested in learning more about the Sapo mine, you should obtain a copy of *The Mineralogical Record*, Vol. 40, No. 4 (July-August 2009) and read the article on the Sapo mine by Luiz Menezes (pp. 273-292). I took some of the above information about the Sapo mine from that article. Write to The Mineralogical Record, P.O. Box 3565, Tucson, AZ 85740 or minrec@aol.com for a copy.

Since its varieties are so common, your personal collection should have one or two fine examples of the deceiver, apatite. 💎



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Show Dates from page 10

FEBRUARY 2015

7-8—OAK HARBOR, WASHINGTON: Show; Whidbey Island Gem Club; Oak Harbor Senior Center; 51 SE Jerome St.; Sat. 9-5, Sun. 9-4; free admission; member exhibits, demonstrations, dealers, rough and finished rock and gems, slabs, silent auction, door prizes, kids' corner; contact Keith Ludemann, (360) 675-1837; e-mail: rock9@whidbey.net

13-22—INDIO, CALIFORNIA: Annual show; San Geronio Mineral & Gem Society; Riverside County Fair & National Date Festival; 82-503 Hwy. 111; daily 10-10; adults \$8, seniors \$7, students \$6, children (under 5) free; indoor dealers, 108 showcases, jewelry, gems, beads, crystals, geodes, jewelry repair, lapidary demonstrations, geode cutting; contact Bert Grisham, 1029 N. 8th St., Banning, CA 92220, (951) 849-1674; e-mail: bert67@verizon.net

14-15—ALBANY, NEW YORK: Annual show; Capital District Mineral Club; New York State Museum; Empire Plaza, Madison Ave.; Sat. 10-5, Sun. 10-5; adults \$5, children free; museum exhibits and tours; contact Michael Hawkins, 3140 CEC, Albany, NY 12230, (518) 486-2011; e-mail: mhawkins@mail.nysed.gov; Web site: www.nysm.nysed.gov

20-22—INDIANAPOLIS, INDIANA: Annual show; Indiana State Museum and Historic Sites; Indiana State Museum; 650 W. Washington St.; Fri. 10-5, Sat. 10-5, Sun. 11-4; adults \$12, seniors \$10, children \$7; dealers, regional clubs, adult and kids' activities; contact Peggy Fisherkeller, 650 W. Washington St., Indianapolis, IN 46204, (317) 232-7172; e-mail: pfisherkeller@indianamuseum.org; Web site: www.indianamuseum.org

21-22—ANTIOCH, CALIFORNIA: Annual show; Antioch Lapidary Club; Contra Costa County Fairground; 1201 W. 10th St.; Sat. 10-5, Sun. 10-5; adults \$5, children (12 and under), Scouts in uniform, and active military with ID free; jewelry, gems, findings, supplies, slabs, auction, grab bags, exhibits, hands-on projects for kids; contact Brenda Miguel, 115 Hillside Ln., Martinez, CA 94553, (925) 301-6957; e-mail: Brenda.miguel@yahoo.com; Web site: www.antiochlapidaryclub.com

21-22—BOISE, IDAHO: Annual Rock and Gem Show; Idaho Gem Club; Expo Idaho; 5610 Glenwood; Sat. 10-6, Sun. 10-5; adults \$3, children (12 and under) free; contact Brent Stewart, (208) 342-1151; e-mail: rocksbrent@gmail.com

21-22—LAS CRUCES, NEW MEXICO: Annual show; Friends of the Museum; New Mexico Farm & Ranch Heritage Museum; 4100 Dripping Springs Rd.; Sat. 9-5, Sun. 10-5; adults \$5; contact Dawn Starostka, PO Box 15150, Las Cruces, NM 88004, (575) 522-1232; e-mail: dawn@helpinghandevents.com; Web site: www.lcmuseumrocks.com

21-22—MESA, ARIZONA: Annual show; Apache Junction Rock & Gem Club; Skyline High School; 845 S. Crismon Rd.; Sat. 9-5, Sun. 10-4; adults \$3, students \$1, children (12 and under) free; dealers, jewelry, gems, cabochons, beads, opals, rocks, slabs, fossils, lapidary equipment and supplies, hourly door prizes, silent auction, gem tree making, raffle, kids' egg-carton rock collections, Wheel-of-Rocks; contact Kelly Iverson, (480) 325-2705; Web site: www.ajrockclub.com

28—LAKELAND, FLORIDA: Annual show; Bone Valley Gem, Mineral & Fossil Society; FPC of Lakeland; 175 Lake Hollingsworth Dr.; Sat. 9-4:30; adults \$3, teachers, students and children free; special teacher raffle prizes, hourly door prizes, Spin & Win Mineral Wheel, kids' Treasure Dig, demonstrations, educational displays, silent and Chinese auctions, more than 30 dealers, rocks, minerals, fossils, jewelry, gifts, hobby supplies, wire wrapping and cabochon making craftsmen; contact Kim Price, PO Box 2054, Auburndale, FL 33823, (863) 412-9156; e-mail: IBVGMFS@gmail.com; Web site: www.bonevalley.net

FEBRUARY-MARCH 2015

28-1—JACKSON, MISSISSIPPI: Annual show; Mississippi Gem & Mineral Society; State Fairgrounds; Trade Mart Building; Sat. 9-6, Sun. 10-5; adults \$5, students \$3; gems, jewelry, minerals, fossils, beads, books, lapidary tools, free demonstrations, cutting, faceting, jewelry making, flint knapping, wire wrapping, kids' activities and educational exhibits; contact Ricky Odum, Jr., (601) 750-8765; e-mail: rickyhalfeather@icloud.com; Web site: <http://missgms.org>

28-1—SAN FRANCISCO, CALIFORNIA: Show and sale; Pacific Crystal Guild; Fort Mason Center; 2 Marina Blvd.; Sat. 10-6, Sun. 10-4; adults \$8, children (under 12) free; contact Jerry Tomlinson, PO Box 1371, Sausalito, CA 94966, (415) 383-7837; e-mail: jerry@crystallfair.com; Web site: www.crystallfair.com

continued on page 58

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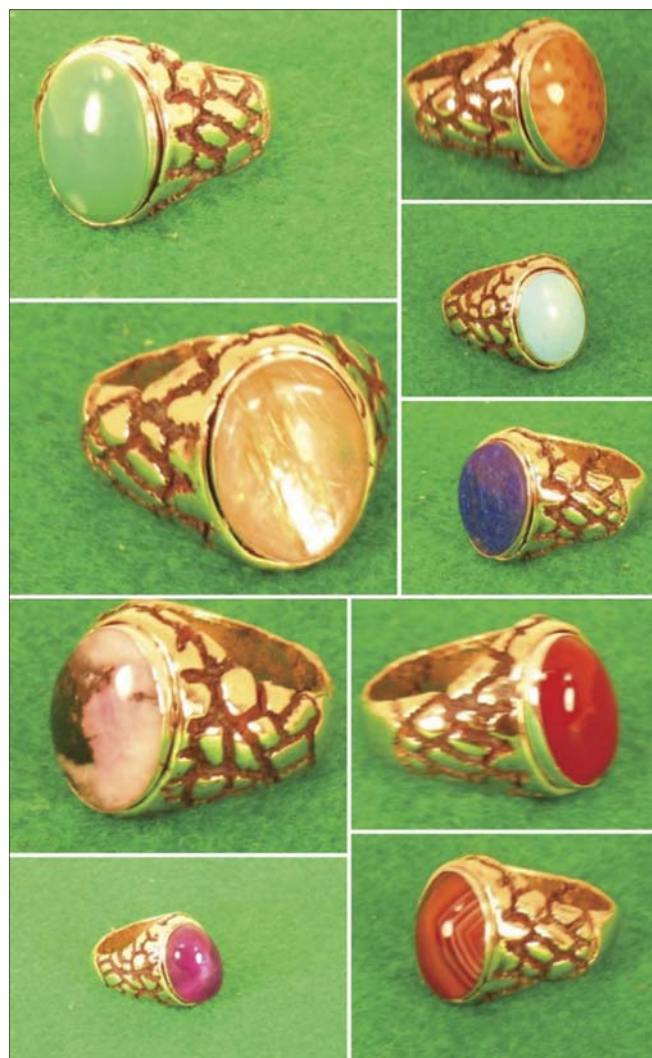
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Story and Photos by Dave Fisk

I like to have rings displaying lots of different stones, but the price of gold is such that I decided to cast one ring with a setting that would allow me to could swap out stones simply and quickly.

I thought about using magnetic catches on the inside bottom of the ring, with a steel insert at the top of the ring bezel, to hold the stones in. The magnet would have to be pretty strong, however, and the clearance for both a magnetic catch and base might be too much for the limited space.

I thought about using a built-in cage over the top of the stone, into which the stone can be slipped as you put the ring on your finger, but a cage would partially obstruct the view of the stone.

Finally, I thought about using a bezel cup with a hole drilled in the bottom and a small bolt placed through the hole, with a nut on the inside bottom of the ring to hold the bezel and stone in place. The issue with using a bolt through the bezel cup was that the bolt head had to be very thin so as not to use up the vertical wall space in the bezel cup. The bezel cup solution seemed to offer the best chance of success. I planned to grind down the top of the bolt as much as possible.

- Wax model ring(s) for casting
- Gemstone slabs
- Bezel cups (13x18)
- Metal for casting
- Sprue wax
- Investment
- Epoxy (or superglue)
- Small bolts with nuts to fit (8NC32)
- Wax scrap for stone platform
- Green soap
- Debubbleizer
- Flux
- Win-ox™
- Pickle (Sparex™)

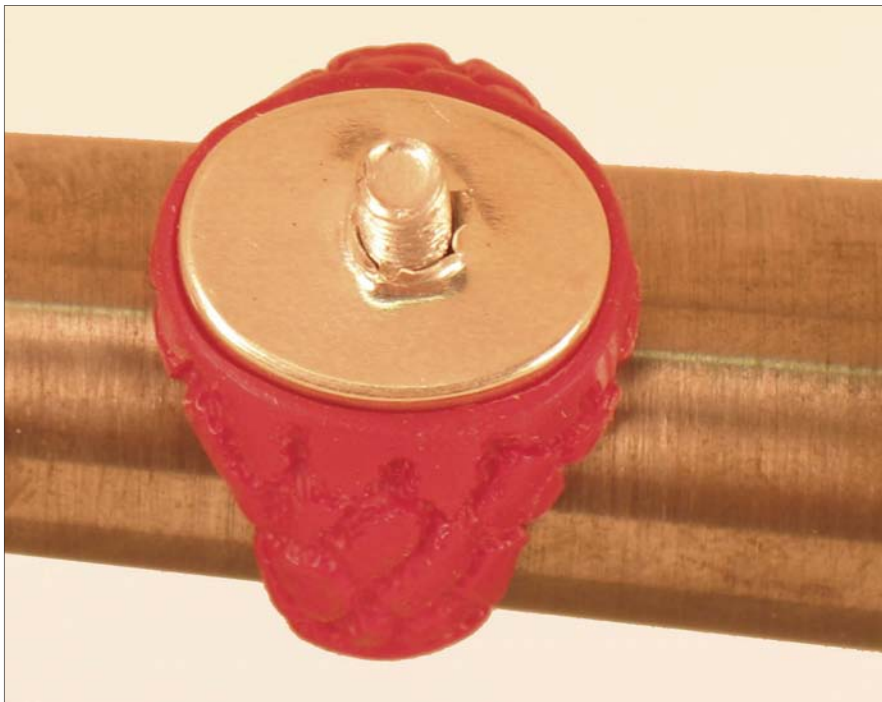
MATERIALS

- Alcohol lamp
- Razor knife
- Nylon stocking
- Wax file
- Wax tool
- Ring mandrel and stand
- Rubber investment bowl
- Water measuring vessel marked in cc's
- Sprue base
- Flask
- Baking sifter
- Scales
- Investment vibrator
- Burnout oven
- Centrifuge
- Torch (air and acetylene)
- Carbon rod
- Tongs
- Bucket of cold water
- Toothbrush
- Jeweler's saw and 3.0 blade
- Metal burr
- Flex shaft
- Awl
- Burnisher
- 1/64-inch drill bit and drill
- Foam-backed sandpaper: super fine, ultra fine and micro fine
- Files
- Buff with Tripoli and rouge
- Propane torch
- Small paintbrush

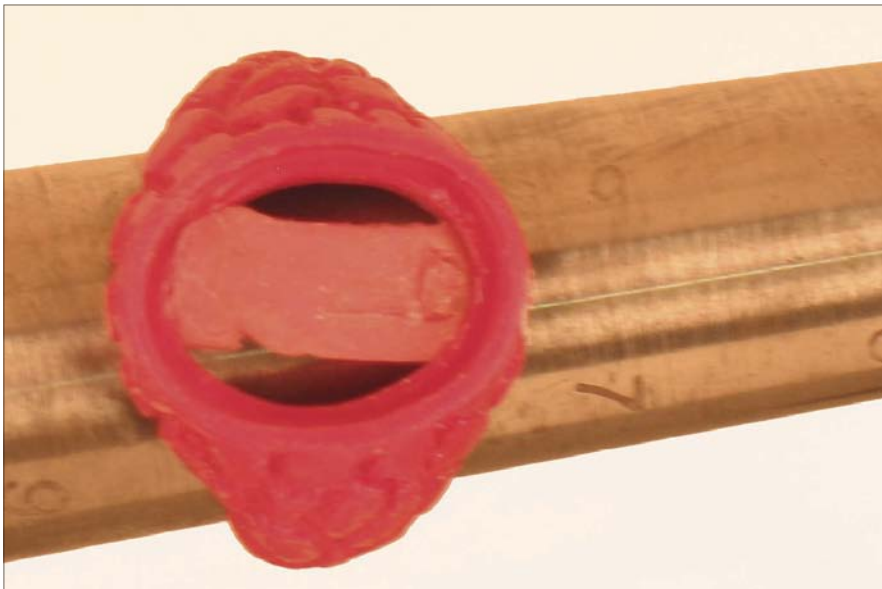
TOOLS



I found five different wax ring models that seemed usable for creating a ring with a large enough opening for a 13-mm by 18-mm stone.



Mark the model for a stone seat by pressing a bezel cup into it open side down. The nut will attach from the bottom of the stone seat.



Size the model and add a platform for securing the bezel.

I decided to use a commercially available wax model for the ring rather than creating one myself. This would save me at least four or five hours. I selected five wax patterns from the Web site www.waxpatterns.com that seemed to offer a good possibility for creating a lost wax cast ring that had a large enough opening for a 13-mm by 18-mm stone. I wanted the stone to be that size so it could display more pattern and color variations. Any smaller and the stone sort of disappeared, and any larger was too large in my mind. I ordered three copies of each of the waxes, allowing for a mistake or two.

In the same spirit of work avoidance, I opted for ready-made bezel cups, rather than soldering a bunch on my own. The rigor of creating a bunch of identical-size bezels was thereby avoided. I ordered 18 13 mm by 18 mm silver bezel cups from www.riogrande.com, allowing a few extra for mistakes.

MODIFYING THE WAX MODEL

When the waxes and bezels arrived, I selected the wax I liked best and set about enlarging the stone seat to accommodate one of the 13X18 bezel cups. I pressed the bezel cup into the wax, open

side down, so the bezel opening left an impression on the stone seat the size of the bezel cup, then used the outline created as a guide to scrape the wax away as needed. A little scraping around the inside of the stone seat, along with trial and error when setting the bezel cup into place, was required.

When the bezel cup sat in the stone seat properly, I sized the model to my finger (10 $\frac{3}{4}$). Then I modified the model to add a flat surface on the ring at the bottom of the stone seat. This surface provides a platform for the bolt to pass through the bezel cup and then through the stone seat. The nut can be placed on the other side of the seat to secure the bezel and stone in place.

To size the ring, I placed it on a ring mandrel on a stand and cut through the ring shank next to the natural sprue on the wax model with a razor blade. I pulled the two ends apart and slid the ring up the mandrel to the 10 $\frac{3}{4}$ size marking. I then put a small piece of wax into the gap. Using heat from an alcohol lamp and a wax tool made from a nail and dowel, I added liquid wax to the joint and finished sizing the ring model. To make the tool, I drilled the dowel to accept the nail so the dowel became a handle. I pounded the nail flat at the end and then shaped it like a small spoon.

Next, I filed and sanded the joint in the model and smoothed the surface with a piece of old nylon stocking.

I took a scrap of wax about 10 mm wide, 13 mm long, and 1 mm thick, placed it in the bottom of the stone seat, added liquid wax to cement it in place, and finished it similarly to the ring shank joint.

CAST THE RING

I added a 10 mm wax wire to the bottom of the model to act as a sprue during the casting process. As the ring was fairly large and would use a lot of gold, I created a small ball $\frac{1}{4}$ inch from the sprue using liquid wax. This ball acts as a reservoir when casting, and assists in filling the mold completely with metal. I smoothed the sprue and ball area using file, sandpaper and stocking.

Next, I weighed the wax on my gram scale. The weight was 2 grams. I went through my gold scrap and found some rings I had previously cast using 18K dental gold reclaimed from an old bridge. It was very clean and had only been used once, so I decided I would cast using only the

scrap. (I often do this, and only very infrequently get pit or crystallization in the metal casting.) Using the formula 2 grams (wax weight) times 15.2 grams (gold), I set aside 30.4 grams of metal, plus a few grams for fudge factor, to be used in the ring.

I washed the wax model using green soap with a small paintbrush. When it had dried, I spritzed the model with debubbler and set it aside to dry. I got a sprue base and sprue cleaned up and attached the wax model sprue end to the sprue base using liquid wax. I smoothed out the joint as before. I made sure that the length of the ring and attached sprue base would place the top of the ring $\frac{1}{4}$ inch from the top of the flask when the flask was placed around the ring and into the base.

For a 2.5-inch-tall, 2-inch-diameter flask, Kerr Satin Cast 20 investment, 68 cc's of water, and 6 ounces of investment would be needed. I prepared a vial with the water, then used a baking sifter to sift 6 ounces of investment into a rubber bowl. The sifting helps keep lumps from forming in the investment. Putting most of the water in the bowl of powder, I mixed the two carefully with a small spatula, trying not to introduce bubbles. When the mixture was very smooth and the consistency of pancake batter, I placed the bowl on an investment vibrator and vibrated for 30 seconds to remove bubbles. I then poured the investment into the flask, filling it to overflowing, and vibrated the mold gently until bubbles stopped appearing (about 40 seconds).

About 10 minutes later, the investment was set well. I twisted the sprue holder and pulled it away from the flask. I eyeballed the dot of wax that appeared at the end of the indentation left by the sprue holder to make sure that, when it melted, a path would be created that was sufficient to allow the metal to enter the mold. I used my finger to smooth the impression.

The following morning, I set my burn-out oven to 300° and turned it on. When the oven reached 300°, I placed the mold in the oven, open side up. Watching the temperature on the pyrometer, I gradually brought it up to 900°, then flipped the mold over, open side down. I brought the temperature up to 1300° over the next three hours, then brought it back to 1200° for one hour.

I wound the centrifuge arm three rotations and lifted the rod up to hold the



Melt the metal and use the centrifuge to drive the metal into the mold.



Clean up the casting using files and sandpaper, then buff with Tripoli and rouge.



Drill an 1/64-inch-diameter hole through the ring's stone platform to accept the bolt.



With the bezel cup seated in the ring, punch a hole in the bottom with an awl.

arm of the centrifuge in place. I then placed the metal in the shoe (crucible) of the centrifuge and turned on the torch (air and acetylene). Heating the metal rapidly, adding flux (borax) to the metal with a carbon rod, and drawing the rod through the molten metal to draw off impurities, I waited for the metal to form a shiny, rolling metal ball in the shoe and then, keeping the flame on the metal, released the arm of the centrifuge and lifted the torch simultaneously. The arm swung sharply, driving the metal into the wax-evacuated mold. When the arm gradually came to a halt, I lifted the mold with tongs and swirled it in a bucket of cold water, causing the mold to disintegrate.

When I took the casting out of the bucket, it was a shiny gold color and completely formed, and had only a few tiny metal bubbles to remove.

CLEAN AND FINISH THE CASTING

Going to the sink, I cleaned the casting with water and a toothbrush under running water. I sawed through the metal sprue using a jeweler's saw and 3.0 blade, separating ring and sprue. I tested the size of the stone opening by placing a bezel cup on the stone seat. The metal shrinkage during casting caused the bezel cup to be slightly too small, so I had to use a metal burr in a flex shaft tool to enlarge the opening slightly so the bezel cup would fit. I then finished the ring using files and super fine, ultra fine



The bolt head has to be very thin so as not to use up the limited vertical wall space in the bezel cup.

and micro fine sandpaper. Then I polished it, first with Tripoli and then rouge, on cloth buffing wheels.

The design of the ring was kind of a nugget composite, with deep areas between nuggets. I felt a little antiquing would intensify the effect. I got out Win-ox™. It's pretty potent, so use it carefully. I cleaned the ring thoroughly in pickle (Sparex™), heated it slightly using a propane torch, and applied the Win-ox with a small paintbrush, saturating the canals between the nuggets. They turned a satisfying black. I then buffed the nugget portion with a buff and jeweler's rouge. It really popped.

SETTING THE STONES

To secure the stone and bezel cup to the ring, I used an aluminum bolt with an 8NC32 thread that was part of a loose leaf

binder bolt and nut. I filed the top of the bolt head until it was as thin as possible, but still had some structural integrity. I selected a drill bit slightly larger than the bolt (1/64 inch) and drilled a hole through the stone seat. I placed a bezel cup in the stone seat and used an awl to punch a hole through the bezel cup base at the site of the hole through the stone seat. I filed away the burs left around the hole using a small rattail file.

Through trial and error, I found that the best way to get the bolt properly set in the bezel cup and to get the stone set in the cup was to finish grinding and polishing the stone, ensuring the edges of the stone were slightly below the wall of the bezel cup when placed atop the bolt head. This left enough metal to burnish over the stone to hold it in place.

(Actually, I placed the finished stone on the bench upside down, placed a drop of superglue on the center of the stone back, and slipped the cup, with the bolt fitted in place, over the bottom of the stone, all the way down.)

After the glue dried, I used a burnisher to press the metal around the stone. I could then slip the bolt through the hole in the stone seat, and attach the nut from the bottom.

I created more stone, bolt and bezel cup combinations. Now I can change the stone every day for two weeks and never have the same ring. 💎

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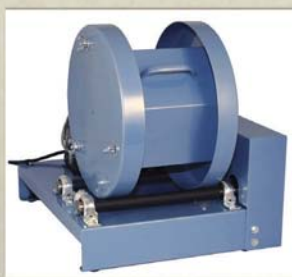
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ROCK SCIENCE

by Steve Voynick

Figuring Out the Feldspars

What do amazonite gemstones, scouring powder, and Chinese porcelain have in common? The answer is feldspar—as either the sole or major ingredient.

Feldspar is not a mineral name, but the name of a group of 19 aluminosilicate minerals that make up about 60% of Earth's crust. The name stems from the German *Feld*, or "field", and the Old German *Spath*, or "spar", which refers to any cleavable, lustrous mineral.

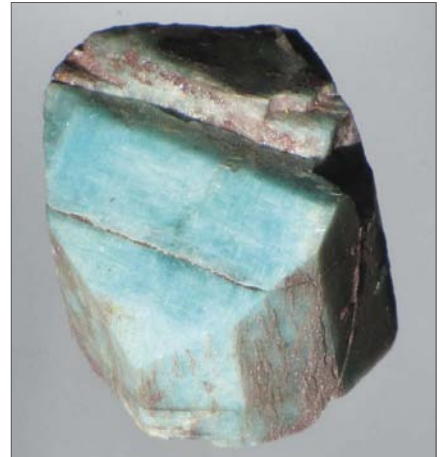
The term "field spar", or "fieldstone", alludes to the tendency of feldspars to weather into soil-building clays. Because all feldspars have a Mohs hardness of 6.0-6.5 and a vitreous luster, any glassy mineral that is a bit softer than quartz but has a similar density is likely to be a member of the feldspar group.

The feldspars are structurally and compositionally related to quartz (silicon dioxide, SiO₂). All are tectosilicates, or framework silicates, that are built around the silica tetrahedron (SiO₄)⁴⁻, in which a silicon ion is surrounded by four oxygen ions in a tetrahedral shape. But the aluminum ion Al³⁺ is also stable within the silica tetrahedron and can replace a silicon ion to create a negative electrical charge. To re-establish electrical stability, the resulting aluminosilicate radical must accept another positively charged ion. Positively charged ions with suitable radii to fit between the tetrahedra include those of potassium, sodium and calcium. This partial replacement of silicon ions by aluminum ions and the subsequent bonding of potassium, sodium or calcium ions creates the feldspar minerals.

The feldspars fall into two subgroups: alkali feldspars (also "potassium feldspars" or "K feldspars") and plagioclase feldspars. The important alkali feldspars are anorthoclase, sanidine, orthoclase and microcline. The important plagioclase feldspars are albite and anorthite, which form a solid-solution series, the intermediate members (not mineral species) of which include oligoclase, andesine, labradorite and bytownite.

Feldspars have considerable geological and industrial importance. They are among the most abundant rock-forming minerals, and they weather into soil-building clays. Feldspars are used to manufacture glass, ceramics and paper, so mining and processing feldspar minerals are global, billion dollar-per-year industries.

Powdered feldspar is also the abrasive used in household scouring powders. Because its hardness (Mohs 6.0-6.5) is less



Greenish-blue amazonite is a color variety of the feldspar mineral microcline.

than that of many types of glass, the powder cleans glass, but doesn't abrade it.

The feldspars include several gemstones. Greenish-blue amazonite, a color variety of microcline, can be cut into beautiful cabochons. Another is translucent moonstone, a general term for several feldspar minerals and varieties that exhibit adularescence, an optical phenomenon in which diffused light creates a soft, bluish-white sheen.

Transparent orthoclase and bytownite crystals are faceted into striking, champagne-colored gems. In the labradorite variety of anorthite, twinned lamellae produce labradorescence, a play of lustrous, metallic, blue-green colors caused by interference in light reflected from its layered structure. The translucent, aventurine variety anorthite contains tiny inclusions of the iron minerals hematite and goethite. They reflect light in a reddish-gold, metallic glitter that justifies aventurine's familiar name "sunstone".

Although albite is not itself a gemstone, it contributes to the beauty of many composite mineral specimens. In its crystalline and massive forms, glittering, snow-white albite is the perfect matrix mineral to show off crystals of pegmatite gemstones like aquamarine or elbaite.

Whether humble or sophisticated, feldspar plays many roles in our daily lives. ♦

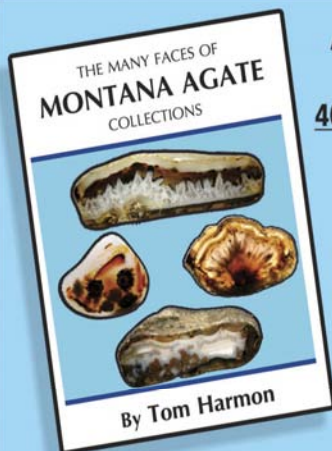
Steve Voynick is a science writer, mineral collector, former hardrock miner, and the author of books like *Colorado Rockhounding* and *New Mexico Rockhounding*.



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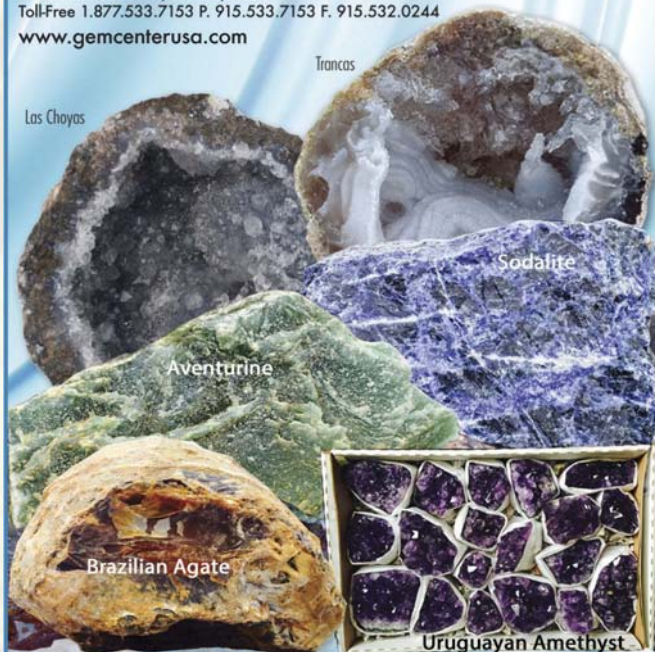
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Fossil Shark Teeth

Shark teeth are fun fossils because (like dinosaurs) sharks are fearsomely fascinating and (unlike dinosaurs) their fossils are common. A shark may have as many as 50 teeth in a row and behind them are 6-20 more rows bent back and ready to spring forward as front teeth are shed. A single shark may shed 35,000 teeth over its lifespan! These are made of durable enamel, which aids in fossilization. These two factors account for the abundance of fossil shark teeth.

Fossil shark teeth come in varied colors, sizes, and shapes. Teeth of living sharks are white but, as they fossilize, they take on colors of minerals in sediments in which they're buried and become tinted yellow-orange, tan, brown, gray or black. They vary in size depending on the species. The largest, *Carcharocles megalodon*, can reach 7 inches. Most are under an inch. Teeth also vary in shape. Different species have different types of teeth for different functions: flattened enamel for crushing crustaceans; pointed teeth for spearing fish; serrated teeth for tearing chunks from marine mammals. Just as our incisors and molars are different, the same shark may have very different teeth. A shark may have smooth bottom teeth for stabbing and grabbing and serrated upper teeth for slicing and dicing. This variation in shape and function makes it difficult to identify species with fossil shark teeth.

Sharks are an ancient lineage. The first forms date back 400 million years! Because they've been around so long, they're found in sedimentary rocks around the world. Moroccan phosphate mines are especially known for them and account for many fossil shark teeth on the market. They're common in many places throughout the United States. For instance, I've collected them from Illinois limestone quarries, New Jersey streambeds, Nebraska and California hillsides, Maryland's Chesapeake Bay cliffs, and the Gulf beaches of Florida.

—Jim Brace-Thompson



SPECIAL EFFECTS:

Labradorescence

Labradorite is a feldspar mineral. It often appears in masses with speckled appearance similar to granite, but it does something that makes it more special than granite.

A glance at labradorite shows it to be a vitreous rock containing densely intergrown crystals of varying shades of clear-white, gray, brown, blue, green, and yellow. Take a closer look and move the stone at different angles. Those colors shift, giving off a shimmering milky-metallic glow. This optical effect is called labradorescence.

Some have called this effect "electric blue light", and the better the blue sheen, the more expensive the rock. It's caused by internal structures selectively reflecting back only certain colors from different angles. Labradorite crystals have lamellar intergrowths (thin adjacent layers), and the different layers capture and diffract incoming light at differing angles, so you see colors shift and move as you turn the stone. Similar effects seen in other minerals include iridescence, adularescence, and play of color. With labradorescence, metallic colors seem to glow from below the surface of the gemstone.

With a Mohs hardness of 6–6.5, labradorite makes a durable gemstone and holds a nice polish. In the jewelry trade, stones are cabbed and mounted in large pendants and earrings. Because it can be mined in massive blocks, it's a popular material for cutting into slabs for dramatic countertops.

The "type locality" (where it was originally discovered) for labradorite is near Nain on Paul's Island, Labrador, in northeastern Canada, but it's also known to come from Norway and other spots worldwide. The Canadian Inuits have a legend that the Northern Lights become trapped in rocks until a warrior set them free with blows from his spear. While most sprang free to grace the night skies once again, some remained trapped in the stone we now call labradorite.

—Jim Brace-Thompson



What's Your Mineral Name?

Combine the words that correspond to your first, middle and last initials to find your mineral name.

Example: LDV = Massive Metal Blaster

	First Name	Middle Name	Last Name
A	Botryoidal	Nugget	Amygdule
B	Rocky	Andradite	Facet
C	Hexagonal	Fracture	Crystal
D	Pretty	Metal	Pocket
E	Fluorescent	Lapidary	Nodule
F	Perfect	Stope	Digger
G	Radioactive	Gem	Vug
H	Heavy	Nugget	Streak
I	Carbonate	Opal	Asterism
J	Unstable	Moonstone	Miner
K	Oxide	Mica	Cleavage
L	Massive	Meteor	Density
M	Oolitic	Lapis	Bucket
N	Greasy	Geode	Silicate
O	Fossilized	Vein	Detector
P	Volcanic	Habit	Polymorph
Q	Micro	Magma	Cutter
R	Fine	Earth	Strike
S	Igneous	Fault	Trilobite
T	Molten	Smithsonite	Collector
U	Petrified	Crust	Species
V	Lustrous	Quartz	Blaster
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DARRYL POWELL ILLUSTRATION

FOSSILS:

Earth's Photo Album

Lithified Remains Give a Picture of Ancient Life



The middle Green River formation of Eocene limestone in Wyoming, where collectors can dig for fossil fish, is a prolific source.

Story and Photos by Bob Jones

When I was kid, before World War II, the only place you ever saw a fossil was in a museum. I lived in southern Connecticut, and in 1936 my teacher took 35 4th- through 6th-grade students on a field trip to the Yale Peabody Museum. We walked into the dinosaur room and were thrilled by the huge skeletal remains of a brontosaurus, a triceratops, various ancient crocodiles, and a host of other creatures.



These nicely prepared nautiloids in limestone will make a fine addition to someone's home or office décor.



Rockhounds who are interested in finding fossil trilobites can easily collect them by splitting slabs of the shale rock at Antelope Springs, Utah.

Today, however, kids don't have to go to museums to see the skeletal remains of life from hundreds of millions of years ago. Just drop in at any good gem and mineral show, and you'll not only see a wonderful display of bony fossils, but you can even buy authentic fossilized remains or replicas of your favorite ancient life forms. Some of the credit for the emergence of fossils on the public scene goes to movies like "Jurassic Park", but an earlier scientific effort called the International Geophysical Year (IGY), held in the late 1950s, raised public awareness of ancient life on Earth.

The IGY was established by a team of scientists from all over the world. Its goal was to apply the technical equipment developed during World War II to the study of every aspect of the earth and sky, including early life. All the data gathered was subjected to a coordinated study. The information gained raised awareness and interest in every discipline, including paleontology.

The history of the discovery of ancient life goes back centuries. The ancient Greeks were well aware of fossils, but could not explain them. Some thought they had simply fallen from the sky. Others were sure the devil had planted them to mislead people who believed in God. Still others were sure



The softer core of this fossil dinosaur bone has been replaced by lovely banded agate.



Los Angeles' La Brea tar pits are a good source of relatively young fossils, like those of the 12,000-year-old saber-toothed cat *Smilodon*.

the huge bones they found were evidence of the Great Flood. From those ancient days until the 18th century, fossils remained unexplained—but not for lack of trying. *The First Fossil Hunters: Dinosaurs, Mammoths, and Myth in Greek and Roman Times*, by Adrienne Mayor (Princeton University Press, 2011), makes the case that the monsters of ancient legends had their origins in paleontology.

In the 17th century, what we now call the Age of Reason began in Europe. Science moved away from natural philosophy and alchemy, and toward empiricism and rational thought. Great advances were made in medicine, politics, and human reasoning. By the 1800s, scientists were challenging ancient beliefs about fossils, for they realized that fossils told a story of early life on earth.

It was the work of 17th-century Danish scientist Niels Steno (who worked in Italy as Nicolas Steno) that laid the foundation for our modern science of the study of ancient life. In 1822, that science was given the name paleontology.

Steno realized that rocks had been laid down in layered sequences. He was able to explain the existence of fossils by showing how once-living flesh could be replaced by stone. He also solved one of the great puzzles of his day: how the fossilized remains of sea life could



Among the earliest fossils are 400 million-year-old trilobites, which can be found in ancient rocks all over the world.



The surrounding stone has been carved away to expose this pair of ancient ammonites from Morocco in relief.

be found in rocks that were miles from the ocean and well above sea level.

Steno's explanation of the sequential layering of rocks is now called the Law of Superposition. It states that, as the earth developed, its rocks formed in layers, one atop another. Steno posited the theory that some layers were laid down on the seafloor and were later uplifted and exposed when the great seas receded. As Steno's ideas spread, I suspect that Charles Darwin saw the truth in them, and his thinking was influenced as a result.

One young person who was undoubtedly influenced by Steno's theories was a girl named Mary Anning, who lived at Lyme Regis in the early 19th century. Situated on the south shore of England, the seaside town was well known for the fossils found in its coastal cliffs and on its beaches. It lies in approximate center of a stretch of fossiliferous exposures dubbed the Jurassic Coast.

By the time Mary was 12 years old, she had gotten into the hobby—or rather business—of collecting fossils from the Blue Lias cliffs near her home. The cliffs expose a sequence of limestone and shale layers laid down in the Jurassic and Triassic periods. Her family was poor, and Mary sold the fos-

sils to museums, scientists, and even local gentry, who wanted to display them in their cabinets of natural objects.

Mary was not just an ordinary collector; she studied scientific literature on marine fossils, learned to identify them, and dissected living creatures to better understand their anatomy. So when she found a large array of bones, she recognized that they were something special. They proved, in fact, to be the fossil remains of an ichthyosaur, a huge sea-going reptile—the first ever found. This find made Mary locally famous. She went on to make other significant discoveries, including the first fossil of a pterosaur (a flying reptile) ever uncovered in England.

Today, a plesiosaur type specimen that Mary found hangs in the Natural History Museum in London. A small photograph of Mary is displayed in one corner of that exhibit.

In the latter half of the 20th century, the importance of and growing interest in fossils moved from museum halls to mineral shows, and from there to the interior décor of offices and even private homes. Huge slabs of gray rock with fossils embedded in them are a common sight in waiting rooms and living rooms. In any curi-

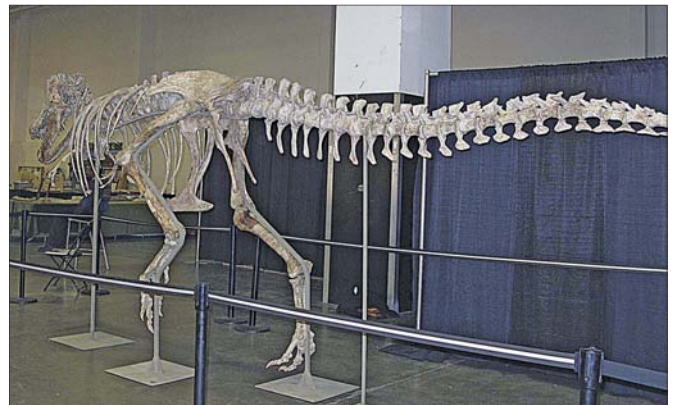
ous youngster's bedroom, you'll find fossil shark teeth and books on dinosaurs next to marbles and electronic games. Fascination with ancient life has definitely invaded popular culture!

Along with a strong interest in fossils has come a much broader range of fossil types. In my youth, only the megafossils were exhibited: huge skeletons of dinosaurs, ancient crocodiles, camels, mastodons, giant bears, and the like. Today, you can find giant fossil remains along with small clamshells, belemnites, nautiloids, ammonites, trilobites, turtle shells, and other creatures, exposed on slabs of sandstone, shale or slate, for sale at mineral shows. The appearance of quantities of dinosaur eggs from China the last decade has added interest to the fossil marketplace.

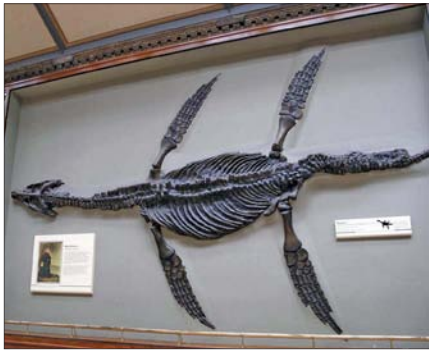
Today, it is not unusual to see spectacular fossils being used by show promoters to increase attendance. Displays of amazing examples of dinosaurs, plesiosaurs, ammonites, saber-toothed cats, and mastodons are now commonly seen. These displays attract families, who then become exposed to minerals as well as fossils. Some of the credit for this surge in interest has to be given to very realistic



This Mesozoic Age fossil pterodactyl appears to be poised to drop on visitors to the Perot Museum in Dallas, Texas.



What would a major gem and mineral show be without an example of everyone's favorite fossil, a *Tyrannosaurus rex*?



The first discovery of a pleiosaur was made by amateur fossil hunter Mary Anning in the limestone cliffs of Lyme Regis, England.

movies like "Jurassic Park". Even the interest in amber has increased as a result of that movie and its sequels.

Like other major shows, the big New York/New Jersey Metro show held in Edison, New Jersey, each April featured several exceptional fossils in its special exhibits. The big Denver Gem and Mineral show held in September goes one step farther by inviting Mr. Bones, a.k.a., Tim Seeber, to walk the floor of the show in his remarkably constructed foam rubber *Tyrannosaurus rex* skeleton replica. He climbs inside the skeleton and walks the show floor, frequently bending forward so the hinged jaw of the *T. rex* engulfs the head of a kid who is begging to be "eaten". Adults and children alike enjoy watching Mr. Bones mix with the crowd.

While dinosaur remains are the more spectacular special displays at a show, I enjoy seeing the remains of other, more ancient creatures, including ammonites. The spiraling shells of one of earth's earliest sea creatures are fascinating display exhibits. Ammonites are named for Ammon, an Egyptian god that was pictured as having curling ram's horns, a shape that most ammonites resemble. They were originally called "Ammon's stone". Ammonites are members of the cephalopod family of sea creatures; modern members include the nautilus, squid and octopus.



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FOSSILS from page 41



The gray limestone of Morocco produces huge quantities of marine fossils, which are often used to decorate offices and homes.

A second type of cephalopod that lived in the ancient seas is the baculite, whose shell did not coil. Today, we see myriad baculite fossils in gray limestone from a huge deposit in North Africa. Slabs of baculite fossils are quarried and shaped and polished as decorative stone. Workers using air chisels expose the fossils in relief. Slabs of this fossiliferous limestone that measure several feet across are used for decorative stone. When polished flat, the same stone can serve as a very interesting tabletop, with dozens of baculite fossils visible.

Some baculite fossils display a very attractive pearly surface layer that is iridescent, making them extra fancy for display. There are ammonites, however, that outdo baculites with their attractive surface. In an Alberta, Canada, deposit, the fossilized, mineralized ammonite shells exhibit an iridescent play of color. Korite International, the mining company that owns the deposit, markets the organic gem material as Ammolite.

Iridescent ammonite shells have been known of since 1913, but they date back over 70 million years. The amazing display of colors seen on these ammonites comes from the outer layer of nacre that covers the coiled ammonite shell.

The nacre, also called mother of pearl, is made up of microscopic platelets of aragonite that act as a diffraction grating, separating white light into its component colors. The play of color is dominated by green, red and orange; blue and violet are seen less often.

These colorful ammonites are found in what is called the Bearpaw Formation near Lethbridge, Alberta. The formation contains ironstone concretions in a bed of shale, and the ammonites are found in the ironstone.

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The nacre on the ammonites is thin, so for use in jewelry it is typically capped and backed with clear spinel, and sometimes even impregnated with plastic to stabilize and strengthen the gem. To learn more about this fascinating gemstone, visit www.korite.com or do an Internet search for "ammolite".

The frequent introduction of all sorts of fossils into gem and mineral shows has added another important dimension to our hobby. The science of paleontology has entered the public consciousness, which means that fossils discovered in the field have a much greater chance of surviving because of the interest collectors now have in the science. On rare occasions, amateur rockhounds and fossil hunters have made important discoveries, contributing to the science of paleontology just as Mary Anning did over a century ago.

Currently, exciting things are happening with fossils. The La Brea Tar Pits, which have been closed since 2007, are now open to the public again. You can watch scientists excavate the sticky asphalt to obtain beautifully preserved remains of 10,000- to 12,000-year-old creatures. The Page Museum exhibits of these creatures are breathtaking, as they reveal life as it was in Southern California thousands of years ago.

In the 1980s, an unusual bird fossil was found in North Carolina. The skeleton, which has now been completely excavated, shows that this bird had a wingspan of around 20 feet. It is the biggest fossil bird ever found.

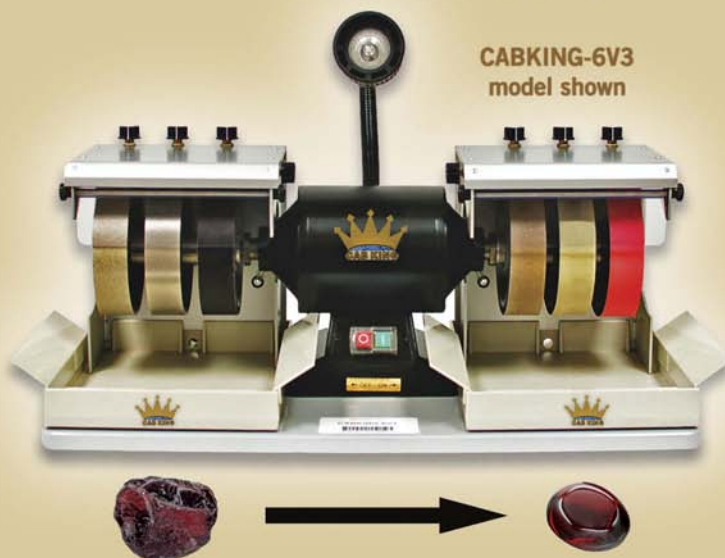
Rockhounds who are interested in collecting fossils should understand the federal rules covering the removal of any paleontological resource from public land. It is inevitable that rockhounds will encounter ancient remains while rock hunting in the field. Learn the rules before you head out, and save yourself an unpleasant encounter with the Feds. 💎



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Rockpick Legend Co.

A Full-Service Utah Rock Shop

Story and Photos by Steve Voynick

After becoming fascinated by rocks and minerals as a boy, Rick Dalrymple went on to pursue that interest in a big way—by purchasing his own rock shop and developing it into Rockpick Legend Co., a full-service rock shop that ranks high among the best in the West.



Rockpick Legend Co. is familiar to rockhounds and mineral collectors throughout Utah and the surrounding states.



The family that runs the business includes (from left) Zeke Dalrymple, Josh McElwain, Rick Dalrymple and granddaughter Evie, Adrienne Dalrymple McElwain and daughter Inara, Frederick Dalrymple and Constance Dalrymple.



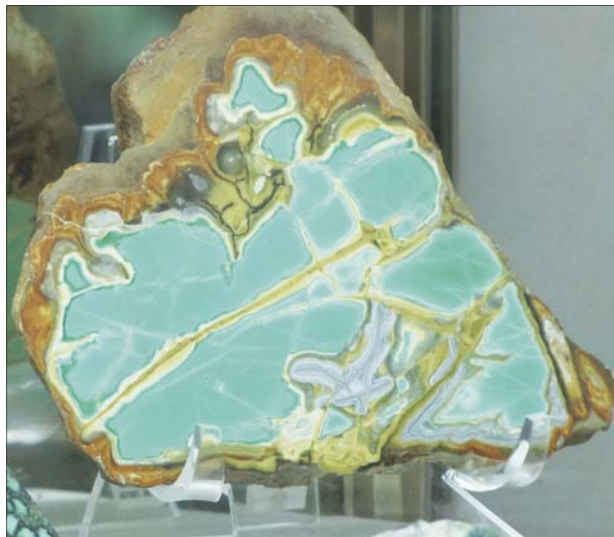
Rock and lapidary rough—onyx and alabaster to petrified wood and dinosaur bone—are sold by the pound.

Located in downtown Salt Lake City, Utah, Rockpick Legend Co. does much more than sell mineral specimens and rock-hounding supplies. Its staff visits schools to talk about minerals, presents classes on an array of topics related to mineral collecting, arranges and guides field trips to classic collecting localities in Utah and neighboring states, provides lapidary services, and offers appraisals and free mineral-identification services. As if that isn't enough, Rockpick Legend Co. also maintains an in-shop museum that exhibits 500 superb specimens of Utah minerals.

"The shop reflects my own high level of interest and enthusiasm for minerals and gemstones," Rick says. "Over the years, minerals have provided me with a great deal of enjoyment, learning and satisfaction, and I'd like to pass some of that along to others."

Rick became interested in rocks and minerals when his 6th-grade teacher assigned him a science fair project that required a visit to Lewis' Rock Shop in Salt Lake City, a little shop that Dr. David Lewis Sr. had opened in 1964. Dr. Lewis was a retired, pioneering kidney-transplant surgeon who had practiced at the nearby University of Utah medical center and was respectfully known by his friends as "Old Man Lewis".

"That shop was a hobby for Old Man Lewis," Rick recounts. "He opened and closed it whenever he felt like it. He traveled a lot and visited mineral localities



A frequently admired specimen in Rockpick Legend Co.'s in-shop museum is this superb 8-inch variscite from the classic locality at Clay Canyon, Utah.

around the world. I can remember him bringing back a beautiful selection of rubies from Burma's Mogok Valley."

Intrigued by the colors and crystal forms of the minerals at Lewis' Rock Shop, Rick began collecting minerals himself. He was a frequent visitor to the shop, where Old Man Lewis took him under his wing and taught him the finer points of field collecting, assessing the quality of mineral specimens, and building and organizing mineral collections. Although Rick didn't know it then, that little rock shop, along with his own rapidly growing interest in minerals, would change his life forever.

When it came time for college, Rick focused his studies on minerals and mining. He attended the Montana School of Mines in

Butte before transferring to the University of Utah to continue pursuing a degree in geological and mining engineering. While at the University of Utah, Rick also worked at Lewis' Rock Shop, often taking his pay in mineral specimens instead of cash. By then, Old Man Lewis had passed away and his son, David Lewis Jr., owned the shop.

One spring day in 1995, when Rick was a senior at the university, he showed up as usual to work at the shop. "I don't know if Dave was having a bad day or what," Rick recounts, "but he looked at me and said, 'I wish you had the money to buy this place.' Although I had known the shop for 20 years and loved working there, I had never given serious thought to owning it. But the idea was fascinating. I talked it over with my wife, Anita,

and she had no objection."

The clincher was that Rick had an unlimited line of credit on his credit card. A few weeks later, he and Anita used that card to buy Lewis' Rock Shop.

"From the beginning," Rick says, "we knew this was a chance to work in a field that we really loved."

As a full-time rock shop owner, Rick never finished his senior year at the university. Instead, he immersed himself in the job of developing his vision of what a full-service rock shop should be.

One of the first orders of business was a name change. Anita came up with the name "Rockpick Legend Co.," a combination of a rockhound's primary tool and a map legend.



A collection of 35 gleaming pyrite pyritohedrons from Utah's Bingham Canyon copper mine are displayed in order from large to small.



The main floor of the Rockpick Legend Co. store has more than 1,500 mineral specimens on display; another 10,000 specimens are stored in flats.

Several years later, Rockpick Legend Co. moved. "We wanted a location closer to downtown Salt Lake City," Rick says. "Anita checked online and found an auto shop for sale on South Main Street, just five minutes from downtown. We bought it, moved in, and we've been here for the past nine years."

The shop has since evolved into all that Rick envisioned it could be—and more. Rockpick Legend Co. is billed as "Your Complete Rock Experience", a slogan that is fully justified because its impact extends far beyond the shop itself.

Rockpick Legend Co. is well known for its guided field collecting trips. Over the years, Rick—himself an avid and experienced field collector—has befriended the owners of many privately owned, prime collecting sites.

"Most of our sites are posted and closed to the public," Rick explains. "All are productive, so no one leaves empty-handed. Our field trips are also an educational experience. I organize and personally guide these trips, inform everyone about the equipment they'll need, provide instruction on how to collect effectively and safely at each particular locality, and explain the local geology, mineralogy and history."

Each collecting site is assigned a difficulty rating so that field trip participants are fully aware in advance of its accessibility and the nature of the terrain, as well as the availability—or absence—of nearby facilities such as restrooms and restaurants. At some localities, Rick even arranges for mechanical equipment to "turn over" the rock to expose new material.

Rockpick Legend Co. field trips suit collectors at all levels of experience, from beginners to veterans. Beginner trips are a learning experience and an opportunity to collect under expert supervision; for those

with experience, the trips are a chance to visit prime sites, most of which are otherwise inaccessible to the public. While age restrictions sometimes apply to particularly difficult and challenging field trips, most are open to everyone.

The collecting trips, which can last from a single day to a full weekend, are popular among families, especially with single parents seeking outdoor-recreation opportunities for their kids that are safe, supervised, educational and enjoyable.

Rick has led field trips throughout Utah and to surrounding states. Recent Utah trips have included visits to A New Dig Inc., a site near Delta that yields beautifully detailed trilobite fossils; the Dugway geode beds near Dugway for quartz-lined geodes; the Blue Crystal mine at La Sal Mountain in San Juan County for crystalline and nodular azurite and malachite; and the Solar Wind claim in the Thomas Range (Juab County) for topaz, red beryl, and bixbyite. Rick also leads one field trip each year to the Bob Ingersoll mine at Keystone, South Dakota, a pegmatite site where participants can collect beryl, elbaite, schorl, lepidolite, apatite-(CaF), and even specimens of radioactive, uranium-bearing minerals.

Much of Rick's time goes into teaching classes and holding clinics—more than 100 per year—all of which take place at the shop. Rick conducts most of the classes, assisted by Rockpick Legend Co. staff members and occasional guest instructors. Classes are limited to 20 participants and last from one to six hours. Topics cover the full spectrum of the mineral hobby and include geology, mineralogy, jewelry making, mineral collecting, silversmithing, rock and mineral identification, rock tumbling, wire wrapping, beadwork, flint knapping, meteorites and tektites, beryl varieties, and toxic minerals.

Among the newest classes are "Mineralogy for Mineral Collectors", which explains the basics of the sciences behind the hobby; "Mineral Phenomena", which covers luminescence, magnetism, radioactivity, and other mineral properties; and "The World of Copper", which explains the many copper-bearing minerals and the societal importance of the metal itself—an appropriate topic considering that Rockpick Legend Co. is only 25 miles away from Utah's huge Bingham Canyon copper mine.

"Our classes are as 'hands-on' as possible," Rick says. "We pass around lots of specimens of minerals, fossils, crystals, gemstones and jewelry—whatever is needed to help illustrate the particular topic."

Many classes at Rockpick Legend Co. are directed toward younger collectors, especially those in school, homeschool, and scouting groups. They last about an hour and cover such basic topics as how rocks differ from minerals, the fundamentals of geology, and the many impacts of minerals on society. Each youngster leaves with a mineral booklet and a specimen of Utah coprolite. Special instruction is provided for Scout groups to fulfill merit-badge requirements in fields like geology and mining and society.

"Children have an inherent interest in the world around them," Rick says. "I think it's important to nurture that interest."

Rockpick Legend Co. staff members also visit schools throughout the greater Salt Lake Valley to present hour-long geology and mineralogy talks to as many as 60 students at a time. There is usually one visit per week throughout the school year; during these talks, lots of mineral and fossil specimens are passed around to keep interest levels high.

Rockhounds also make good use of the shop's free mineral identification service. Folks must call ahead to be sure that a qual-



These size-graded Moqui marbles (goethite-rich, sedimentary concretions) from Utah are part of Rick's personal collection.



Zeke Dalrymple has taken over the cutting, cabbing and polishing duties at the Rockpick Legend Co.

ified individual will be at the shop. They are also asked not to bring more than 10 specimens at a time for identification.

"Collectors bring in all sorts of things," Rick says. "Some are disappointed when their specimens are not what they think they are. For example, several people have brought in what they assumed were meteorites. But what they actually had was smelter slag, which can be found in a lot of places in Utah."

But sometimes identification can exceed even the highest hopes. One rockhound collected a specimen in Montana and expected Rick to confirm that the tiny, transparent, colorless crystal was quartz. "It wasn't quartz at all," Rick says. "It was diamond."

Rick also offers an appraisal service for mineral collections, mineral specimens, gemstones and gems. Appraisals cost \$75 per hour with a one-hour minimum. The cost covers the time involved in study and testing, as well as the research into current values of comparable specimens or gems that is necessary to produce accurate appraisals.

Rockpick Legend Co. also provides lapidary services. "Lots of field collectors make nice finds," Rick says, "but they don't have the equipment or the know-how to transform their rough gemstones into gems. We do the cutting, cabbing and polishing for them, and even design and create custom jewelry. That means rockhounds can come to our shop with their rough gemstone finds and leave with the same stones cut, polished, and set into fine jewelry."

Rockpick Legend Co. carries a full selection of rockhounding gear that includes rock picks, bars, hammers, gold-panning equipment, and lapidary supplies. It also carries mineral specimens themselves—more than 1,500 are on display, with another 10,000

stored in flats. The shop also has tons of bulk and rough lapidary rock. Sold by the pound, this bulk material includes—but is not limited to—onyx, jade, snowflake obsidian and Apache tears, white and patterned marble, alabaster, geodes, magnesite, petrified wood, coral, and dinosaur bone in endless colors, patterns and textures.

One of Rockpick Legend Co.'s biggest attractions is a superb display of mineral specimens that are *not* for sale. These are part of Rick's personal collection of more than 500 museum-grade specimens of Utah gemstones, minerals and fossils, including rare Utah minerals and specimens from Utah type localities and old mines that have been closed for years.

One particularly interesting specimen is of turquoise from the Bingham Canyon mine, a locality that is not known for turquoise. This 5-inch specimen of gem-quality turquoise is in a matrix of brecciated, altered limestone and adorned with crystals of galena and pyrite.

Visitors can also examine a fine selection of 8-inch, cut and polished half-nodules of variscite from all four Utah variscite localities, including the classic and now-closed Clay Canyon site near Fairfield. Each of these specimens has a rich green color; many have the yellow rind and internal veining of crandallite, a related phosphate mineral that is often associated with Utah variscite.

Other specimens include a large, bright-yellow calcite from the Sioux-Ajax mine in Utah's Tooele County; 40 gleaming pyrite dodecahedrons from the Bingham Canyon mine that measure 1 to 4 inches in diameter and are arranged by size; an array of Utah "Moqui marbles", goethite-rich, sedimentary concretions, also arranged by size; a bright-blue chalcantite specimen from the Bertha mine in Tooele County; and a beautiful, 3/4-inch-long crystal of raspberry-

red beryl in an off-white rhyolite matrix from the Wah Wah Mountains.

The most unusual specimen in Rockpick Legend Co.'s in-shop museum just might be a 2-inch, bright-green, partially fossilized ground squirrel skull from the Blue Crystal mine in Utah's San Juan County. After the skull had been buried in sediments with circulating, copper-rich groundwater, the copper-carbonate mineral malachite precipitated out of solution and replaced part of the organic bone material.

Rockpick Legend Co. maintains a Web site packed with information about shop services, class and field trip schedules, upcoming events, photographs, and articles written by Rick about various aspects of mineral collecting. Topics include everything from field trip etiquette and Utah mineral localities to specimen preparation techniques, tumbling tips, mineral terminology, and field collecting safety. There's even a photo gallery with 80 images of specimens from such Utah districts as Bingham, Tintic, Big Indian, and Clifton. The Web site also offers basic information designed especially for youngsters.

In March 2014, Rick published *Utah's Gems: Lapidary Materials of Utah*, a 316-page, softcover book that is illustrated with 385 color photographs, most of which are of specimens from Rick's personal collection. The book's cover features a striking photograph of a Tiffany Stone geode from Utah's Spor Mountain. Along with such classic Utah minerals as red beryl, variscite and bixbyite, the book discusses 42 types of agate and jasper, 11 fossil gem materials, and four types of geodes.

"This book is something of an autobiography," Rick explains. "It describes my 40-plus years of experience in studying, collecting, and working with minerals. I've visited many of the localities and collected many

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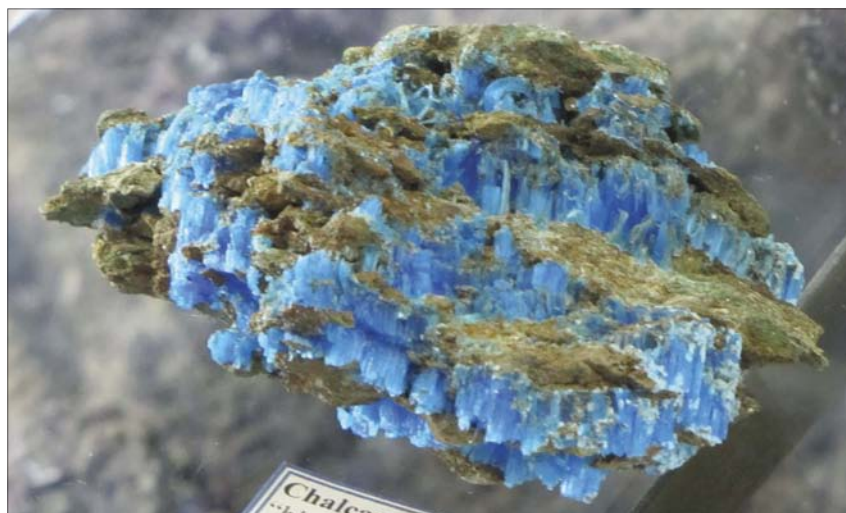
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Rockpick Legend Co. from page 47



This 5-inch specimen of bright-blue chalcocite from the Bertha mine at Dugway, Utah, is part of Rick's personal mineral collection.

of the minerals and fossils that I mention in my book. The book is not intended to be a field-collecting guide, but to fill a gap in the literature by providing insight and information that supplements the guides."

Rick will soon publish a second book, *The Unique Rocks and Minerals of Utah*, that includes rare Utah minerals and Utah type localities.

Rick's books, like Rockpick Legend Co. itself, are a family affair. While Rick does the writing, his oldest daughter, Adrienne McElwain, takes the photographs, and his sons Alston, Zeke and Frederick and daughter Sydney do the lapidary work on the specimens in the photographs. At the shop, Anita handles the accounting and marketing, while Adrienne manages the Web site and online communications. Another daughter, Constance, works in shipping, receiving, and jewelry making, while Zeke has taken over the cutting, capping and polishing duties from his brothers Alston and Hamilton. Son-in-law Josh McElwain presents classes for youngsters.

Rockpick Legend Co. hosts several special, annual events. In May, "Crystal Festival Utah" celebrates the metaphysical aspects of minerals and crystals with such classes as "Introduction to Meditating with Crystals" and appearances, talks and readings by noted metaphysical practitioners.

The "Rock Shop Rock Show," a three-day event featuring Utah artists, vendors, and jewelry makers, along with classes and demonstrations and a grand raffle, is held in September. The 2014 Rock Shop Rock Show opened with an "After-Dark Fluorescent Party" that featured fluorescent mineral displays, lectures on various aspects of luminescence, and a black light photography workshop. With 17 special guests giving talks and demonstrations, the Rock Shop Rock Show drew about 900 visitors.

A major attraction at the Rock Shop Rock Show is the "One-Dollar Table," where

hundreds of mineral and fossil specimens are marked down for sale at \$1 each. Scattered among these discounted specimens are a number of prime specimens that are worth as much as \$200 each.

"The key to success at the One-Dollar Table," Rick says, "is to get there early."

The rock shop celebrated its 50th anniversary in June 2014—the first 31 years as Lewis' Rock Shop and the last 19 years as Rockpick Legend Co. Rick foresees a bright future.

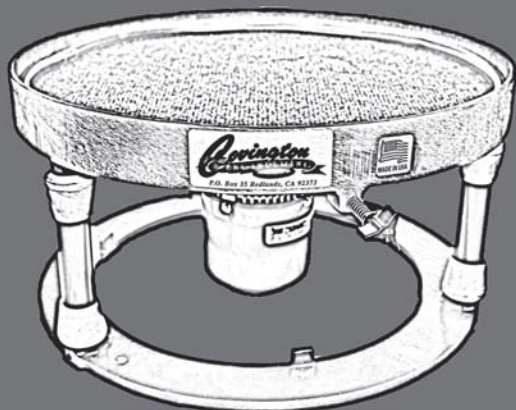
"Since we bought the shop, we've grown almost every year," he says. "This is a family-operated business, and that's the way we'd like to keep it. The grandkids are coming along now, so between the shop's continuous growth and the interest in rocks and minerals from our new generation, I think we'll be around for a long time."

Any rock shop, of course, is dependent to varying degrees upon the strength and popularity of rockhounding itself. Rockpick Legend Co. is a leader in the effort to get kids interested in rocks and minerals.

"Young people represent the future of rockhounding and mineral collecting," Rick says. "Mineral collecting is everything a hobby should be. It's not only a tremendous educational experience, but it's also challenging, satisfying, and a lot of fun. So it's important to get young people interested."

Rockpick Legend Co. is doing just that with its field trips and presentations to schools and scouting groups. But Rick even goes a step farther—by teaching teachers. He instructs schoolteachers throughout the greater Salt Lake Valley on appealing, interesting, exciting and relevant ways to present rocks and minerals to students—a service he provides without charge.

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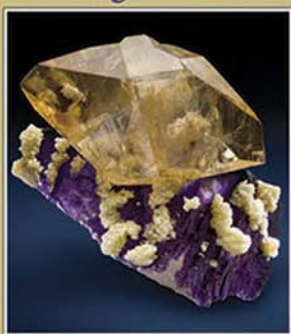
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WHAT TO CUT

by Scott Empey

Red Horn Coral

Red horn coral is a type of fossilized coral that has been replaced with agate, and cuts some gorgeous little gemstones. Its color can range from white to pink to a nice, deep red, and it has intricate patterns radiating from the center. It usually comes in pieces that resemble a section of the cylindrical horn shape. I always keep an eye out for these fascinating fossils when perusing rock shows.

It is one of those lapidary materials that are somewhat rare, but still around if you look; sometimes, you find a nice little bag from an old collection or maybe just a few pieces at a fossil booth. As long as they have a nice red or pink color, they always end up in going home with me.

Horn coral is a variety of coral that flourished during the Middle Ordovician to Late Permian periods (250 million to 500 million years ago). Coral reefs as we think of them today are built by colonies of individual animals; the reef is made up of calcium carbonate that is secreted by individual corals. Horn corals, by contrast, are the remnants of a single organism, the lone wolves of the coral world. When a young horn coral attached itself to an undersea object, it began to grow longer and wider at the top. The top-heavy shape resulted in a bend that made it resemble an animal horn.

In the Permian period, a shallow inland sea covered Utah and large areas of the western United States. As the earth evolved, the waters receded and sediments covered the coral reefs. Over time, the horn coral was fossilized and replaced by agate. These days, their fossilized remains are found in Riley Canyon, Utah, about 40 miles east of Salt Lake City. The canyon is way up in the mountains at about 9,000 feet elevation. From what I understand, you can still go collecting there, but it sounds like a good bit of work to get to the site. Fortunately, there is usually some to be had on eBay and from other online resources—no hiking involved.

When selecting horn coral for lapidary work, I think the most important thing is color; I pretty much scoop up anything with nice shades of pink or red color going all the way across the section, as long as it is large enough to make a nice gemstone. Sometimes, the agate will have some cal-



cite on the outside of, or mixed in with, the agate, or have a lot of white areas; these pieces I pretty much avoid. The shape and size of the horns are a bit limiting in terms of the shapes you can cut. I tend to do a lot of rounds and wide teardrops. You can get some longer ovals if you slice the material at a slant across the cylindrical shape, but if you slant it too much, you start to lose the wonderful patterns. 💎

Scott Empey, owner of Gerard Scott Designs, creates hand-cut gemstones, designer jewelry, and props for the motion picture industry. His Web site is www.gerardscottdesigns.com.





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SANDIA MOUNTAINS TRAVERTINE

Calcium Carbonate in Southeastern New Mexico

Story and Photos by Robert Beard



Fragments of travertine at first appear to be spongy masses of brown dirt, but close inspection reveals an intricate pattern of crystallized calcium carbonate.

Albuquerque is a great city for anyone who is interested in geology and minerals. Virtually every type of geologic terrain can be seen within a three- to four-hour drive of the city, but unless you live in Albuquerque or have significant free time on your vacation or business trip, many places may be just out of reach. However, the Sandia Mountains, which are just east of Albuquerque and the dominant feature of the skyline, offer some interesting hikes and mineral deposits that you can access even at the end of your workday. One of the most accessible places to visit is Travertine Falls, which is located along the South Crest Trail in the southeastern Sandia Mountains.

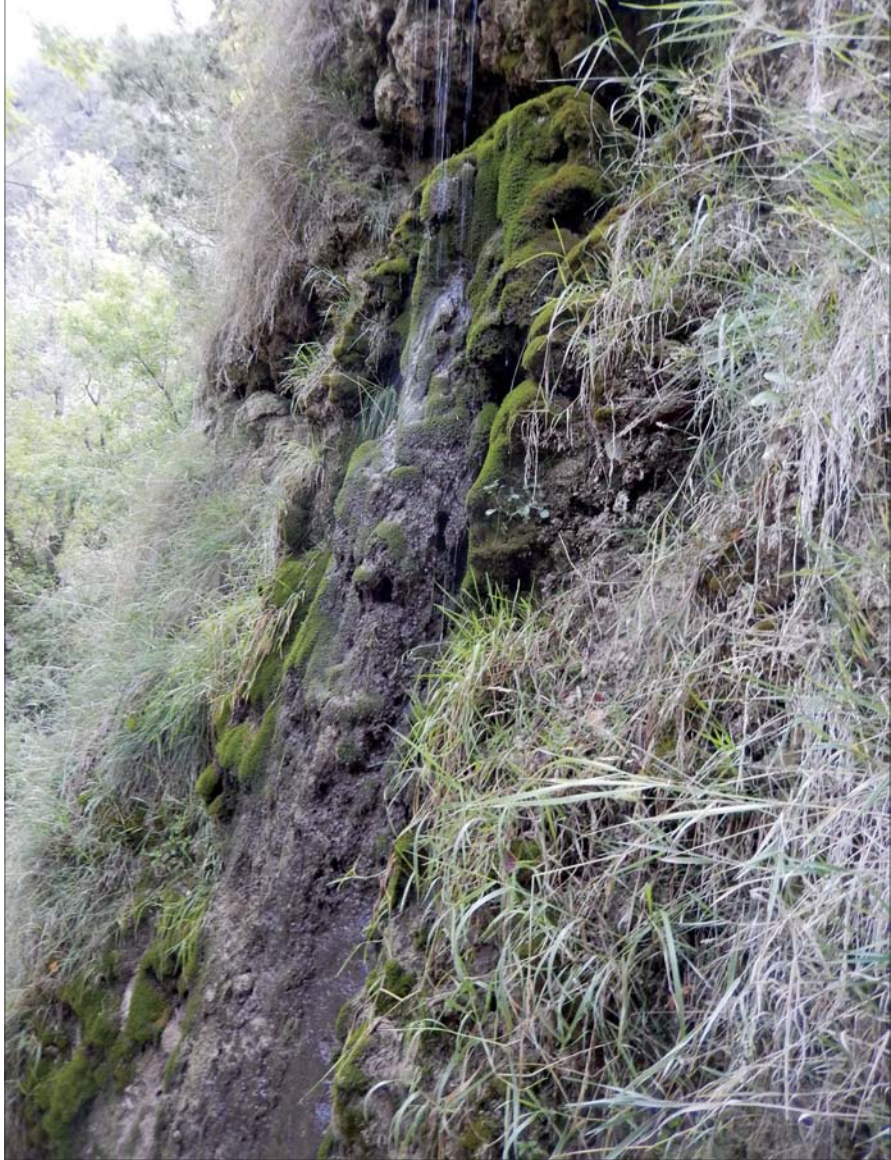
I have been to this site many times, and it is one of my favorite hikes in Albuquerque. I first visited Travertine Falls when I was a graduate student in geology at the University of New Mexico. We would often take students there on field trips, as it was a short drive from Albuquerque and then a short hike to the falls.

Travertine Falls is within the Sandia Mountains Wilderness of Cibola National Forest. The trailhead is shown on Forest Service maps as Canyon Estates, and a Forest Service quick reference map is available at www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5407582.pdf. A detailed trail map for the Sandia Mountains Wilderness is available at www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5390081.pdf. The site is marked as a “no fee” zone, so you do not have to pay to park at the trailhead like you have to at many other sites in the Sandias.

Travertine is calcium carbonate that has been precipitated through the dissolution and deposition of rocks and minerals that contain carbonate minerals. In its simplest form it is a light tan to light gray precipitate that forms where cold groundwater or surface waters drain over carbonate-bearing formations. Travertine also forms at hot springs, and sometimes the higher water temperature causes additional mineral leaching, which can color the travertine various shades of yellow, gold, pink, red, and brown. This can lead to denser and more colorful travertine. Travertine forms nearly anywhere when you have a carbonate host rock and a source of dripping or bubbling water. New Mexico has a wide variety of travertine deposits, and many of the larger deposits produce colorful blocks of travertine that are cut into slabs, tiles, and paving stones for the building industry.

A geologic map of the Sandia Mountains Wilderness is available at http://ngmdb.usgs.gov/Prodesc/proddesc_7496.htm. This is Miscellaneous Field Studies Map MF-1631-B, prepared by David C. Hedlund of the U.S. Geological Survey in 1985. The map shows that the area around the falls is

Rock & Gem gives locality information for reference purposes only. Readers should never attempt to visit any of the sites described in this publication without first verifying that the location is open to collecting and obtaining the permission of the landowner/or mineral rights holder.



In September 2013, the waterfall was nearly dry, but the mineralization at Travertine Falls is relentless, and grasses and plant debris are steadily being incorporated into travertine.



Travertine Falls is located approximately a half-mile from the trailhead.

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SANDIA MOUNTAINS TRAVERTINE from page 53



Skeletal fragments of bryozoan fossils can be seen in the outcrops of Upper and Middle Pennsylvanian-age Madera Group limestone on the hillsides northeast of the falls.

heavily faulted, and that many of the faults are near-vertical faults that strike northeast. These are "normal" faults, which are faults where the rocks on the lower side of the fault have moved downward relative to the rocks on the upper side of the fault. The southeastern sides of the faults are the "fallen" blocks, meaning that the rocks to the southeast have dropped relative to the rocks to the northwest. This may have led to the topography that formed the falls. The limestone in this area is Upper and Middle Pennsylvanian-age Madera Group Limestone, which is light gray to dark gray finely crystalline limestone. This limestone was the source of the calcium carbonate that formed the travertine at Travertine Falls.

My latest visit to Travertine Falls was in September 2013. I was in town for business, and had some time at the end of the workday to do some sightseeing. I opted for another visit to Travertine Falls, as although I had been to the Falls previously, I had not been back for several years, and wanted to see if anything had changed.

I was staying in downtown Albuquerque east of the intersection of Interstate 25 and Interstate 40, and I decided to go to the falls via Central Avenue in Albuquerque for at least part of the way. Central Avenue is the old Route 66, and has some historic structures such as old motels, gas stations, and other buildings from the 1930s to the 1950s from when it was a major highway across the United States. Parts of Central Avenue were featured on the television series "Breaking Bad", which was the series about a high-school chemistry teacher-turned-methamphetamine kingpin. I was a big fan and enjoyed the way the Albuquerque scenery was used in the show. I lived in Albuquerque in the early 1980s south of Central Avenue in "the student ghetto", and routinely drove up and down

Central. I always saw strange characters on Central even before the crack and methamphetamine epidemics, and many of the abandoned motels on old Route 66 were active at that time. I never thought I would see some of these sites in a television series, especially on a show that looked at the darkest sides of these places.

I passed the still-active Crossroads motel, which is known as the "Crystal Palace" in "Breaking Bad". I got a couple photos from the road when stopped at the intersection next to the motel, but I did not get out of the car, as I heard the management does not like gawkers. I then drove farther east along Central, passing many abandoned buildings. I soon came to the University of New Mexico section of Central, and passed my favorite Albuquerque restaurant, the Frontier. The Frontier is one of the few restaurants that have stayed in business for a long time on this part of Central, and is one of my favorite restaurants in Albuquerque.

As I drove farther east, I passed through the Nob Hill Section of Central/old Route 66, which is a commercial district area that is popular with tourists and shoppers. Nob Hill, which was named after Nob Hill in San Francisco, officially starts at Girard Boulevard and continues until Washington Street, but the good (i.e., safe) part of the district ends well before Washington Street. You will know when you are out of the area that tourists frequent.

Just before you reach Washington Street, on the north side of Central/old Route 66, is the De Anza Motor Lodge, a long-closed motel that was also featured in "Breaking Bad". Once you cross Washington Street and head east, you begin to enter the bad sections of old Route 66. Many of the stores and motels have been abandoned, and the section of Central Avenue near the State Fairgrounds, which are just north of Central



The outcrops of Madera Group limestone northeast of the falls dip steeply to the south, and fragments of fossils can be seen on the rock surfaces.

and farther east, gets pretty rough. I continued on Central all the way to Tramway Boulevard, and then took I-40 east. At this point, you are leaving Albuquerque.

From I-40, I continued approximately 6.2 miles to Exit 175, and turned left onto state Route 337 North and went under the highway. I turned right onto Arrowhead Trail, then continued about 0.6 mile to the parking area for the trailhead. The drive from Albuquerque is very short, and even with the scenic route I took along Central Avenue it only took about 40 minutes. If I had taken I-40 most of the way it would have cut my time to only 25 minutes. This drive can be done with a two-wheel drive vehicle, as all the roads to the parking area are paved. The parking area had about three or four cars, with space for many more, and I was able to find a parking place quickly.

The trailhead has a display board next to the parking area. No restrictions specifically prohibiting rock or mineral collecting were posted on the board. The display board has a good trail map and some warnings regarding falling trees and a painting of a mountain lion, which I assumed indicated to watch out for mountain lions. The trash container nearby had a warning saying that this was bear country, and the container had an animal-proof latch. In all the times I had been here I had never seen a bear, mountain lion, or any wildlife other than birds. This trail sees lots of hikers and I think most wildlife has been scared away long ago.

The trail is uphill most of the way, and has some loose rocks, but it is an easy hike. It is only about a half-mile to the falls, and I soon arrived at the base of the falls. The falls have a slight overhang, and a small fire pit was in front of the opening beneath the overhang, as well as some graffiti. 2013 had been a fairly dry year, so the falls had very little water.

I climbed up the slope next to the falls to continue on the trail. The trail does not stop at the falls but continues to the top of the ridgeline, and a second trail splits off to the east. I looked for fossils in the Madera limestone next to the trail to the east, as this had the best exposures of limestone.

The limestone beds dip towards the south and it is easy to see how the rocks are layered. Some outcrops have many skeletal fragments of bryozoan fossils. They are easy to see on the limestone surface, but when you break the rock open, the interior of the limestone is solid gray and does not reveal any more fossils. The best way to see fossils at these outcrops is to look at the weathered surfaces.

I soon returned to the trail that went north from the falls. I walked further up the trail towards the ridge, and looked for more fossils in this area. I found some pieces with abundant fusulinids. Fusulinids are small fossils that resemble grains of wheat, and while small, they make interesting patterns on the limestone. I also found fragments with sections of horn corals, but overall the fossils were very scarce above Travertine Falls.

On the way back down the trail to the falls, I looked for the source of the spring that fed the waters that formed the travertine. It is northeast of the trail and a few hundred feet northwest of the falls. Since it was a very dry period it was hardly flowing. Water seeped out of the rocks and flowed imperceptibly downstream to the falls. It would be interesting to see the spring when groundwater levels are high and see how much the flow increases.

Once I returned to the falls, I examined the travertine in detail. The deposit reminded me of many cold-water travertine deposits I have seen in the eastern United States. The travertine was generally light tan to brown to gray, and was full of

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SANDIA MOUNTAINS TRAVERTINE from page 55



Outcrops of the travertine at the falls exhibit plant material structures that have been entirely replaced by limestone.

To get to the site from Albuquerque, take Interstate 40 east to Exit 175. Follow the exit to the intersection with NM-337, turn left (north) and go under I-40. Turn right onto Arrowhead Trail, and stay to the left on Arrowhead Trail, which turns into Thunderbird Trail. Continue to the parking area for the trail-

head. The distance from the turnoff onto Arrowhead Trail and the parking area is about 0.6 miles. At the parking area you will see that the trailhead to Travertine Falls is on the west side of the parking area. Simply follow the trail northward, and it will take you to the falls.

plant remains. The travertine crystallized around blades of grass, roots and twigs, and the vegetative matter soon decayed and the impressions of the grass blades and the circular tubes of the roots and twigs remained. Nearly all the travertine pieces were lightweight as they were porous and full of air pockets. Many of the brown pieces appeared sandy and spongy, but close inspection revealed that the surface was an incredibly intricate pattern of crystalline calcium carbonate, some of which formed tiny boxwork structures.

Before I climbed back down the steep section of the trail to the falls I took another short hike along the trail to the east. In addition to the bedded outcrops, the slopes on the north side of the trail were covered with limestone talus, and while some fossils were present in the talus, they were generally scarce.

Farther down the trail I could get a good view of the hills to the south, and I could see the large cement plant about two miles away. This plant had been built in the 1958 to make cement from the high-calcium limestone that made up these mountains. It was originally Ideal Basic Industries, but it is now operated by the U.S. Cement Division of Grupo Cementos de Chihuahua (GCC). The cement plant is a testament to the areal extent and economic importance of the limestone to the Albuquerque region.

The following are coordinates collected in the field and using satellite photographs from Google Earth (downloaded from www.google.com). All coordinates are referenced using the North American 83 and World Geodetic System 84 (NAD83/WGS84) datum, and are in the degree-minutes-seconds format:

Parking at Trailhead:

35°05'22.60"N, 106°23'29.1"W

Travertine Falls:

35°25'05.42.30"N, 106°23'37.6"W

Spring:

34°05'43.30"N, 106°23'39.20"W

I highly recommend checking the U.S. Forest Service Web site at www.fs.usda.gov/main/cibola/home prior to your trip to verify that no closures are in effect. I went to the site several years ago during an extreme drought, and the Forest Service closed access to the trail due to fire danger. I parked at the trailhead and got out to read the signs about the closure, and within minutes a ranger truck appeared and informed me that I must leave immediately. When they close trails in this ranger district, they do not screw around, so do not go to the falls if they have closed the trail for any reason.

Normally, recreational mineral collecting is permissible in national forests, but this area is within the Sandia Mountains Wilderness. Collecting in wilderness areas is sometimes clearly prohibited, but the sign at the trailhead does not specifically prohibit mineral collecting, and I could not find any information online that specifically prohibits collecting at this site. Due to the fact that this is a commonly used trail and often visited by geology students, some collecting is undoubtedly done by some visitors. If you do decide to collect any travertine or fossils, be aware of potential restrictions. Even if you do not collect any rocks, it is still well worth the trip.

This has always been one of my favorite places to visit when I come to Albuquerque. It is a short and safe hike, well suited for kids and older adults, and it is in one of the most scenic parts of the Sandia Mountains. Go early in the day if possible, as the sun dips behind the ridge in the afternoon and it is not as bright as it is earlier. There are few places near a major city that you can visit so quickly and easily as Travertine Falls. 💎

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Show Dates from page 24

FEBRUARY-MARCH 2015

28-1—VALLEJO, CALIFORNIA: Annual show; Vallejo Gem & Mineral Society; Solano County Fairgrounds, Mc Cormack Hall; 900 Fairgrounds Dr.; Sat. 10-5, Sun. 10-5; adults \$5, children (under 12) free with adult; "Spring Bling": jewelry, beads, necklaces, turquoise, jade, minerals, fossils, crystals, demonstrators, Kids' Corner activities; contact Dan Wolke, 900 Fairgrounds Dr., Vallejo, CA 94590, (707) 334-2950; e-mail: dncwolke@sbcglobal.net; Web site: www.vjgems.org

MARCH 2015

6-8—LARGO, FLORIDA: Annual show; Suncoast Gem & Mineral Society; Minnreg Hall; 6340 126th Ave. No.; Fri. 10-6, Sat. 10-6, Sun. 10-5; adults \$5, students with ID \$4; contact Bill Schmidt, SGAMS, PO Box 13254, St. Petersburg, FL 33733-3254, (727) 822-8279; e-mail: SGAMSGemshow@gmail.com; Web site: www.sgams.com

6-8—RICHMOND, INDIANA: Annual show; Eastern Indiana Gem & Geological Society; Wayne County Fairgrounds; 861 N. Salisbury Rd.; Fri. 10-6, Sat. 10-6, Sun. 11-4; adults \$5, seniors \$3, students \$1, children (under 7) and Scouts and leaders in uniform free; jewelry, minerals, fossils, displays, demonstrators, silent auction, children's activities; contact John LaMont, 1271 Fairfield Ave., Brookville, IN 47012, (765) 647-4894 or (937) 339-1966

6-9—ARCADIA, CALIFORNIA: Annual show; Monrovia Rockhounds; Arboretum Botanic Gardens; 201 S. Baldwin Ave.; Sat. 9-4:30, Sun. 9-4:30; Arboretum admission: adults \$9, seniors and students \$7, children \$4; more than 15 dealers, beads, lapidary, jewelry, minerals, rocks, raffle, grab bags, treasure wheel, geodes, silent auction, kids' corner; contact Rudy Lopez, (626) 351-6283; e-mail: rlopez002@verizon.net; Web site: www.moroks.com

7-8—CALDWELL, IDAHO: Annual show; Owyhee Gem & Mineral Society; O'Conner Field House; 2200 Blaine; Sat. 10-6, Sun. 10-5; adults \$3, children (11 and under) free with adult; dealers, demonstrators, door prizes, grand prize, showcases, black light display, silent auction, Wheel of Gems, sand dig, grab bags; contact Susan Beattie, 104 N. Poplar St., Nampa, ID 83651; Web site: www.owyheerocks.com

7-8—NEWARK, DELAWARE: Annual show; Delaware Mineralogical Society; Delaware Technical & Community College- Stanton Campus; 400 Stanton-Christiana Rd.; Sat. 10-6, Sun. 11-5; adults \$6, seniors \$5, students (12-16) \$4, children (under 12) free with adult; educational exhibits of mineral, lapidary and fossil specimens, regional and university museum displays, dealers, minerals, fossils, gems, jewelry, lapidary supplies, door prizes, demonstrations, gem cutting and polishing, children's table, inexpensive mineral and fossil specimens; contact Gene Hartstein, 9 Verbena Dr., Newark, DE 19711; e-mail: gene@fossilnut.com; Web site: www.delminsociety.org

7-8—VENTURA, CALIFORNIA: Annual show; Ventura Gem & Mineral Society; Ventura County Fairgrounds; 10 W. Harbor Blvd.; Sat. 10-5, Sun. 10-4; free admission; gem, mineral, fossil and lapidary exhibits, 15 dealers, jewelry art demonstrations, silent auctions, raffle, kids' activities, white elephant country store and plant sale; contact Krishna Juarez, PO Box 1573, Ventura, CA 93002, (805) 323-6725; e-mail: info@VGMs.org; Web site: www.vgms.org

12-15—DEMING, NEW MEXICO: 50th Annual Rockhound Roundup Gem & Mineral Show; Deming Gem & Mineral Society; SWNM State Fairgrounds; 4100 Raymond Reed Blvd.; Thu. 9-5, Fri. 9-5, Sat. 9-5, Sun. 9-5; free admission; more than 100 dealers, rough rock, slabs, cabs, handcrafted jewelry, rock-related items, lapidary tools, supplies and equipment, educational demonstrations, children's activities, displays, silent auctions, live auction, drawings, Spinning Wheel, guided field trips; contact Marilyn Page, PO Box 1459, Deming, NM 88031, (575) 544-9019; e-mail: thedgms@gmail.com; Web site: www.thedgms.com

13-15—VICTORVILLE, CALIFORNIA: 39th annual "Tailgate"; Victor Valley Gem & Mineral Club; Stoddard Wells Tailgate; I-15 Exit 157, Stoddard Wells Rd., 11 miles NE of I-15; Daily 8-5; free admission; outdoor event, Saturday field trip for tri-colored marble, silent auctions Saturday and Sunday, more than 50 dealers, rough, slabs, cabs, handcrafted jewelry, minerals, fossils; contact Brett Ward, 15555 Main St., #D4, PMB 214, Hesperia, CA 92345, (760) 954-4323; e-mail: bretts88@verizon.net; Web site: [vvgmc.org](http://www.vvgmc.org)

14-15—CLIFTON, NEW JERSEY: Annual show; The North Jersey Mineralogical Society; Pope John II Center; 775 Valley Rd.; Daily 10-5; adults \$5, seniors \$4, children (under 12) free; more than 25 dealers, minerals, fossils, crystals, lapidary rough, jewelry, free specimens for kids; contact Jeff



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14-15—FILER, IDAHO: 64th Annual Gem Show; Magic Valley Gem Club; Twin Falls County Fairgrounds; Merchant Bldg. #1, 215 Fair Ave.; Sat. 9-5, Sun. 10-5; adults \$2, children (under 12) with an adult free; contact Shirley Metts, 550 Main St. S., Kimberly, ID 83341, (208) 423-4827; e-mail: imetts@centurylink.net

14-15—SAN MARINO, CALIFORNIA: Annual show; Pasadena Lapidary Society; San Marino Masonic Center; 3130 Huntington Dr.; Sat. 10-6, Sun. 10-5; free admission; member displays, demonstrations, jewelry making, carving, dealers, minerals, rough material, jewelry, gems, collectibles; contact Marcia Goetz, (626) 260-7239

14-15—SPRECKELS, CALIFORNIA: Annual show; Salinas Valley Rock & Gem; Spreckels Vets Memorial Hall; 5th St. and Llano St.; Sat. 10-5, Sun. 10-5; free admission; contact Teri Beck, (831) 679-2896; Web site: salinasrockandgem.com

14-15—WAUKESHA, WISCONSIN: Annual show; Kettle Moraine Geological Society; Waukesha County Expo Center; 1000 Northview Rd.; Sat. 10-5, Sun. 10-4; adults \$3, children (under 12) free; agates, minerals, gems, fossils, cabochons, Native American artifacts, geology and Earth history displays, educational speakers, demonstrations, club sales, mineral and gem dealers, jewelry, lapidary, wire wrapping, fluorescence; contact Richard Rosenberger, 245 Meadowside Court, Pewaukee, WI 53072; e-mail: rosenber.w@sbcglobal.net; Web site: kmgsrocks.com

20-22—JACKSON, MICHIGAN: Annual show; Michigan Gem & Mineral Society; Jackson County Fairgrounds-American 1 Event Center; 200 W. Ganson; Fri. 11-7, Sat. 10-6, Sun. 11-5; adults \$4, seniors \$2, students \$1, children (under 5) free; kids' activities, gems, minerals, fossils, beads, jewelry, lapidary supplies, demonstrators, exhibits, displays, silent auctions, door prizes, raffle; contact Sally Hoskin, (517) 522-3396; e-mail: saltoosal2@yahoo.com; Web site: mgmsrockclub.com

21-22—LEMOORE, CALIFORNIA: Annual show; Lemoore Gem & Mineral Club; Trinity Hall; 470 Champion St.; Sat. 10-6, Sun. 10-4; free admission; contact Keith Olivas, PO Box 455, Lemoore, CA 93245, (559) 622-9440; e-mail: george.rsilva@sbcglobal.net

27-29—HICKORY, NORTH CAROLINA: 45th Annual Unifour Show and 2015 Eastern Federation Convention; Catawba Valley Gem & Mineral Club; Hickory Metro Convention Center; 1960 13th Ave. Dr. SE, I-40, Exit 125; Fri. 9-6, Sat. 9-6, Sun. 10-5; adults \$4, students and children free; dealers, exhibits, hourly door prizes, hands-on children's activities, cabbing, faceting and wire wrapping demonstrations, "Somewhere in the Rainbow" exhibit; contact Baxter Leonard, 2510 Rolling Ridge Dr., Hickory, NC 28602, (828) 320-4028; e-mail: gailandbaxter@aol.com; Web site: cvgmc.org/

27-29—INDIANAPOLIS, INDIANA: Annual show; Treasures Of The Earth Gem & Jewelry Shows; Indiana State Fairgrounds, Agriculture/Horticulture Bldg.; 1202 E. 38th St.; Fri. 10-6, Sat. 10-6, Sun. 11-5; adults \$5 for 3 days, children (under 16) free; beads, pearls, gemstones, gem trees, wire wrapping, wire sculpture, silversmiths and goldsmiths, custom work and repairs while you wait, door prizes, classes available, Western jewelry; contact Van Wimmer Show Director, 5273 Bradshaw Rd., Salem, VA 24153, (540) 384-6047; e-mail: van@toteshows.com; Web site: www.toteshows.com

27-29—SPOKANE, WASHINGTON: 56th Annual Gem, Jewelry & Mineral Show; Rock Rollers Club of Spokane; Spokane County Fair & Expo Center; N. 604 Havana, at Broadway; Fri. 10-6, Sat. 10-6, Sun. 10-4; adults \$6, seniors and military \$5, children (12 & under) free; the incredible lapidary artistry of Olive Cohour, more than 40 dealers, 60 display cases, fossils, crystals, gemstones, minerals, specimens, handcrafted jewelry, lapidary supplies and demonstrations, hourly door prizes, youth activities, grand prize; contact David Rapp, (509) 891-6533; e-mail: showchair@rockrollers.org

28-29—CEDAR RAPIDS, IOWA: Annual show; Cedar Valley Rocks & Minerals Society; Hawkeye Downs; 400 6th St. SW; Sat. 8:30-6, Sun. 9:30-5; adults \$2, students \$1, children and groups with adult leader free; educational programs, silent auctions, demonstrations, displays, door prizes, kids' activities, gem sluice, dealers, minerals, fossils, gems, jewelry, tools, equipment, lapidary supplies; contact Marv Houg, (319) 364-2868; e-mail: m_houg@yahoo.com; Web site: www.cedarvalleyrockclub.org

28-29—NORTHAMPTON, MASSACHUSETTS: Western Mass Mineral, Jewelry, and Fossil Show; Connecticut Valley Mineral Club; Clarion Hotel & Conference Center; 1 Atwood Dr.; Sat. 9:30-5, Sun. 10-4; adults \$5, children (12 and under) free with adult, Scouts in uniform free; more than 19 dealers, minerals, crystals, jewelry, gems, lapidary, free exhibits, free mineral specimen for children; contact Lee Champigny, (413) 320-9741; Web site: www.westernmassmineralshow.com or www.cvmineralclub.org

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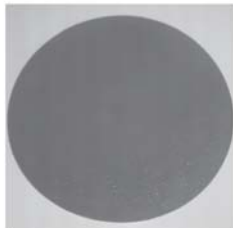
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Show Dates from page 59

MARCH 2015

28-29—PLYMOUTH MEETING, PENNSYLVANIA: Annual show; Philadelphia Mineralogical Society, The Philadelphia Paleontological Society; LuLu Temple; 5140 Butler Pike; Sat. 10-5, Sun. 10-4; adults \$5, children (under 12) \$1; special exhibits by the Academy of Natural Sciences and the Leidy Microscopical Society, fossils, minerals, gems, speakers, exhibits, fossil dig, Kids' Mineral Corner, door prizes, Scouting Merit Badge information; contact Karenne Snow, (609) 353-4101; Web site: www.philamineralsociety.org

28-29—ROSEVILLE, CALIFORNIA: 53rd Annual Show; Roseville Rock Rollers Gem & Mineral Society; Roseville (Placer County) Fairgrounds; 800 All America City Blvd. (off Washington), four buildings, plus outside grounds; Sat. 10-5, Sun. 10-4; adults \$6 (discount coupon on Web site), seniors \$5, children (12 and under) free with adult; educational activities, kids' "Education Station"; exhibits, more than 50 dealers, crystals, fossils, minerals, beads, gemstones, gold panning, mining equipment, meteorites, polished stones, jade, opal, world-class mineral specimens, tourmaline, gold, petrified wood, lapidary demonstrations, silent auctions, free mineral and gem ID, raffle prizes, door prizes, lapidary shop open house, rain or shine; contact Gloria Marie, PO Box 452, Roseville, CA 95661, (916) 216-1114; e-mail: gloriarosevillerockrollers@gmail.com; Web site: www.rockrollers.com

28-29—SAYRE, PENNSYLVANIA: Annual show; Che-Hanna Rock & Mineral Club; Athens Twp. Fire Hall; 211 Herrick Ave.; Sat. 9-5, Sun. 10-4; adults \$3, students \$1, children (under 8) free; museum displays, kids' activities, geode cutting, UV program, dealers, minerals, fossils, gems, lapidary, jewelry; contact Bob McGuire, 224 Church St., Lopez, PA 19628, (570) 928-9238; e-mail: uvbob@epix.net; Web site: www.chehannarocks.com

APRIL 2015

4-5—CHICO, CALIFORNIA: Show and sale; Paradise Gem & Mineral Club; Silver Dollar Fair Grounds; 2335 Fair St.; Sat. 10-5, Sun. 10-4; adults \$3, children (under 16) free; "Petrified Wood": 48 display cases, free specimens for the first 200 children; contact Manuel Garcia, 5659 Foster Rd., Paradise, CA 95969, (530) 877-7324; e-mail: mmmpg@att.net

9-11—WYOMING, MICHIGAN: Annual show; Indian Mounds Rock & Mineral Club; Rogers Plaza Town Center; 972 28th St. SW; Thu. 9:30-9, Fri. 9:30-9, Sat. 9:30-7; free admission; dealers, minerals, fossils, gems, jewelry, beads, rough, equipment, books, displays, demonstrations, children's table; contact Don Van Dyke, 4296 Oakview, Wyoming, MI 49519, (616) 669-6932; e-mail: donvandyke@tm.net; Web site: www.indianmoundsrockclub.com

10-12—ORLANDO, FLORIDA: Annual Spring Gem, Mineral and Bead Show; Central Florida Mineral & Gem Society; National Guard Armory; 2809 S. Fern Creek Ave.; Fri. 1-6, Sat. 10-6, Sun. 10-5; adults \$5 (\$1 off coupon on Web site), students \$2, Scouts free; demonstrations, cabochon cutting, faceting, wire wrapping, flint knapping, metal work, 30-minute auctions, kids' table, sluice mining for gems, hourly door prizes, gems, minerals, beads, metaphysical stones, fossils, Scout merit badges; contact Paul Hayes, 1400 Sawyerwood Ave., Orlando, FL 32809, (407) 816-1229; e-mail: phayes3@cfl.rr.com; Web site: www.cfmgs.org

11-12—ABILENE, TEXAS: Show and sale; Central Texas Gem & Mineral Society; Abilene Civic Center; N. 6th and Pine; Sat. 10-6, Sun. 10-4; adults \$3, students (6-12) \$1.50, children (under 6) and Scouts in uniform free; exhibits, Wheel of Fortune, dealers, fossils, rare minerals, cut and uncut gems, fluorescent display, lapidary supplies and rough, jewelry making equipment, beads, crack your own geode, silent auction, door prizes, grand prize drawing; contact Kay H. McDaniel, 3118 Woodglen Cove, Abilene, TX 79606, (325) 668-8558; e-mail: kmcdaniel23@suddenlink.net; Web site: rockclub.txl.net

11-12—JOHNSON CITY, NEW YORK: Annual show; New York Southern Tier Geology Club; Johnson City Senior Citizens Center; 30 Brockton St.; Sat. 9-5, Sun. 10-4; adults \$3, children (under 12) free; club exhibits, silent auctions, dealers, minerals, fossils, gems, lapidary, jewelry; contact Tom Ogden, 96 Main St., Bainbridge, NY 13733, (607) 967-8552; e-mail: tandjogden@stny.rr.com

11-12—MARION, ILLINOIS: Annual show; Southern Illinois Earth Science Club; Pavilion of the City of Marion; 1602 Sioux Dr.; Sat. 10-6, Sun. 10-5; adults \$2, children (18 and under) free; gems, minerals, fossils, lapidary, fluorescent light shows, door prizes, silent auctions; contact Mike Chontofalsky, 1019 E. Broadway, Centralia, IL 62801, (618) 532-0455; e-mail: chontofalsky@att.net; Web site: siesclub.org

continued on page 67

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1. Publication Title: Rock & Gem
2. Publication No.: 0048-8453
3. Filing Date: 10-01-14
4. Issue Frequency: Monthly
5. No. of Issues Published Annually: 12
6. Annual Subscription Price: \$27.95
7. Complete Mailing Address of Known Office of Publication:
Beckett Media LLC.,
4635 McEwen Rd., Dallas, TX 75244-5308
8. Complete Mailing Address of Headquarters or General
Business Office of Publisher: Beckett Media LLC.,
4635 McEwen Rd., Dallas, TX 75244-5308
9. Full Names and Complete Mailing Addresses of Publisher,
Editor, and Managing Editor:
Publisher Beckett Media LLC.,
4635 McEwen Rd., Dallas, TX 75244-5308
Editor: Lynn Varon, Beckett Media LLC.,
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Managing Editor: Lynn Varon, Beckett Media LLC.,
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10. Owner: Beckett Media LLC.,
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11. Known Bondholders, Mortgagees, and Other Security
Holders Owning or Holding 1 Percent of More of Total
Amount of Bonds, Mortgagees, or Other Securities: None
12. Tax Status (For completion by nonprofit organizations
authorized to mail at nonprofit rates): Not applicable
13. Publication Title: Coinage
14. Issue Date for Circulation Data Below: Nov13 - Oct 14 /
Oct 14
15. Extent and Nature of Circulation:
A. Total No. of Copies (Net Press Run): 20,347 / 19,734
B. Paid and/or Requested Circulation:
1. Paid/Requested Outside-County Mail Subscriptions
Stated on Form 3541: 13,898 / 13,676
2. Paid In-County Subscriptions: 0 / 0
3. Sales through Dealers and Carriers, Street Vendors,
Counter Sales, and Other Non-USPS Paid Distribu-
tion: 1,813 / 1800
4. Other Classes Mailed Through the USPS: 0 / 0
C. Total Paid and/or Requested Circulation: 15,711 / 15,476
D. Free Distribution By Mail:
1. Outside-County as Stated on Form 3541: 363 / 350
2. In-County as Stated on Form 3541: 0 / 0
3. Other Classes Mailed Through USPS: 0 / 0
4. Outside the mail: 219 / 173
E. Total Free Distribution Outside the Mail: 582 / 523
F. Total Distribution: 16,293 / 15,999
G. Copies Not Distributed: 4,054 / 3,735
H. Total: 20,347 / 19,734
I. Percent Paid: 96.42% / 96.73%
16. Total circulation includes electronic copies. Report circula-
tion on PS form 3526-X worksheet: Print Only (No electron-
ic copies)
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PICKS & PANS

News and Reviews

Faceting 1, 2nd Ed.

by Tom Mitchell

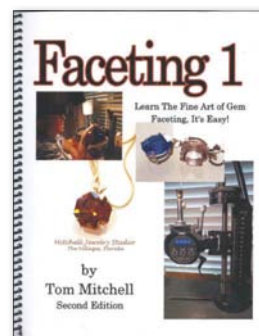
The author describes this publication as "a concise and comprehensive text for beginning faceters". It begins by covering the fundamentals: tools, terms, choosing faceting rough, and the components of a faceting diagram. The text and more than 100 color photos illustrate the preparation of the stone for faceting and the progression of the cutting and polishing steps. The overview concludes with one of Mitchell's own beginner-level designs.

The reference section lists the available faceting design software, as well as books, magazines and Web sites that offer faceting information or supplies. With this 167-page, spiral bound book as a reference manual, the novice can move on to actually faceting a stone. The book is also available as a download from Mitchell's Web site.

The owner of Mitchell Jewelry Studio in Florida, Mitchell teaches faceting classes for the Southeast Federation of Mineralogical Societies and the William Holland School of Lapidary Arts.

—Lynn Varon

\$45 spiral bound, \$35 download (Mitchell Jewelry Studio, www.mitchelljewelrystudio.com)



"Prospectors" Returns

"Prospectors", the Weather Channel series about gem miners, returns for its third season on Sunday, Dec. 7 at 9 p.m. EST. The season will consist of 10 one-hour episodes.

This season, the original cast heads to the mountains of Colorado to seek their fortunes, along with some newcomers who were inspired to join by the others' success. At 14,000 feet above sea level, there's 50% less oxygen, and extreme weather—including close-call lightning strikes and hurricane-force winds—is often these prospectors' worst enemy. But for those willing to battle the elements and confront the danger, there are riches waiting to be unearthed—some of the planet's rarest and most precious gems.

"Prospectors" is produced by High Noon Entertainment. See clips from the series at www.youtube.com/watch?v=zy0x1cvEoPc&list=PLki90Aw2Gjddr6fjerv2u7ASYwpEdebuR&index=1.



Rockhounding Oregon

by Lars Johnson

This paperback text is a lapidary rockhound's field trip companion. It describes some 98 localities, each description accompanied by a site photograph and a color photograph of the material found at that site. The rocks figured are quite typical for the locality, so this is an excellent guide—sans misleading photographs. This book gives the rockhound an honest evaluation of the material.

In addition to a brief, useful description of each locality, the text includes very useful sections related to collecting. The state's geology is described. Information useful to a rockhound includes cautions for the collector, regulations that impact collecting, and GPS coordinates to localities, as well as a list of tools and supplies that will be needed.

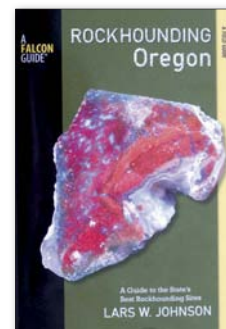
The 279-page volume contains nearly 200 color photos and a few maps. Following the text are useful listings of museums, clubs, and rock shops, a bibliography, and a glossary.

Of particular interest to this reviewer is the author's selection of the Top 10 collecting localities in Oregon, some of which we have written about in *Rock & Gem*. Most rockhounds are familiar with sunstone from Rabbit Basin and agate from Graveyard Point and Short Beach. Richardson's Rock Ranch is well known for its thunder eggs, as is Glass Buttes for obsidian. Also on the Top 10 list are Hampton Butte, Congleton Hollow, and the towns of Fossil, McDermitt and Rome.

Every Oregon rockhound should own this text, and out-of-state visitors will certainly find it a handy guide for successful rockhounding.

—Bob Jones

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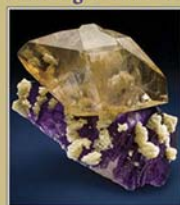
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11-12—YAKIMA, WASHINGTON: 54th Parade of Gems; Yakima Rock & Mineral Club; Central Washington State Fair Grounds; Modern Living Building, 1301 S. Fair Ave.; Sat. 10-6, Sun. 10-4; adults \$3.50, seniors and students \$2, children (under 12) free with adult; displays, dealers, rough rock, finished jewelry, specimens, lapidary equipment, demonstrations, capping, wire wrapping, silent auction, door prizes, raffle, spin the wheel, grab bags, gold panning; contact Marti Sondgeroth, 2013 S. 41st Ave., Yakima, WA 98903, (509) 248-6401; e-mail: marthams@gmail.com

17-19—RICKREALL, OREGON: Show, "River of Gems"; Willamette Agate & Mineral Society; Polk County Fairgrounds; 520 S. Pacific Hwy. West; Fri. 9-6, Sat. 10-6, Sun. 10-4:30; adults \$2, children (under 12) free; contact Etheleen Flippo, (503) 623-4241; e-mail: refflipoo@hotmail.com

18—SEVERNA PARK, MARYLAND: Annual show; Patuxent Lapidary Guild; Earleigh Heights VCF Fire Hall; 161 Ritchie Hwy.; Sat. 10-5; adults \$1, children (under 10) free; "Kids' Corner" dealers, fossils, minerals, cabochons, rough rock and slabs, jewelry; contact Donna Madej, 181 Chelsea Rd., Pasadena, MD 21122, (410) 215-1774; e-mail: littlewings@mdonline.net; Web site: www.patuxentlapidary.org

18-19—KENNEWICK, WASHINGTON: Annual show; Lake-side Gem & Mineral Club; Benton County Fairgrounds; 1500 South Oak; Sat. 10-5, Sun. 10-4; adults \$5, children (12 and under) free; dealers, demonstrations, silent auction, junior activities, door prizes, displays; contact Mary Lou Omstead, PO Box 6652, Kennewick, WA 99336, (509) 783-2798

18-19—LANCASTER, PENNSYLVANIA: Annual show; North Museum of Nature and Science; The Farm and Home Center; 1383 Arcadia Rd.; Sat. 10-6, Sun. 10-5; adults (12 and over) \$5; door prizes, educational demonstrations and lectures, children's activities; contact Alison Mallin, 400 College Ave., Lancaster, PA 17602, (717) 358-7188; e-mail: amallin@northmuseum.org

21-23—IRVINE, KENTUCKY: Annual Kentucky Agate Hunt; Mountain Mushroom Festival; Estell County School's Central Office Gym; 253 Main St.; Tue. 9-4, Wed. 9-4, Thu. 9-4; \$10 per day; all-day Kentucky agate hunt, easy- or rough-terrain trips each day; contact Francine Bonny, Irvine City Hall, 101 Chestnut St., Irvine, KY 40336, (606) 723-1233; e-mail: mushroomfestival@irvineonline.com; Web site: www.mountainmushroomfestival.org

24-26—IRVINE, KENTUCKY: Annual show; Mountain Mushroom Festival, Agate, Gem & Mineral Show; Estell County School's Central Office Gym; 253 Main St., (enter at the back of the gym); Fri. 9-6, Sat. 9-6, Sun. 10-5; free admission; agates, gems, rocks, fossils, minerals, demonstrations, dealers; contact Francine Bonny, Irvine City Hall, 101 Chestnut St., Irvine, KY 40336, (606) 723-1233; e-mail: mushroomfestival@irvineonline.com; Web site: www.mountainmushroomfestival.com

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Bisbee's Rich Mines and History

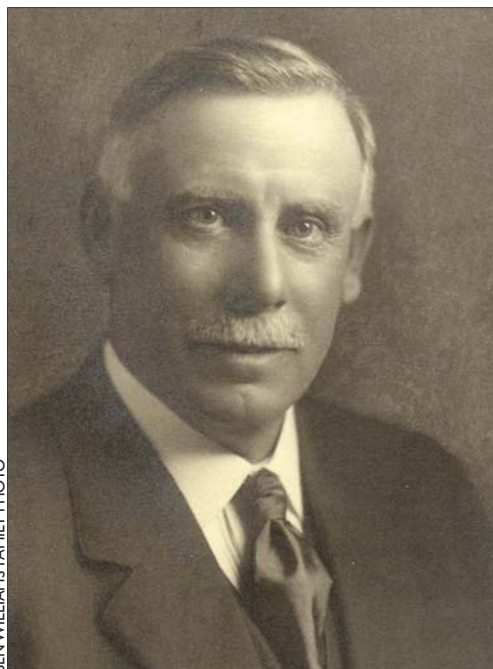
As a rockhound, don't you just love to look at pictures from the old days of mining? I sure do. Many of those mines we see in black-and-white photos produced marvelous specimens that we still cherish today. Unfortunately, however, most of the old-timers were too busy earning a living to pick up rocks.

Here in Arizona, there was an exception at one of the great historically important mining sites, the Warren district, which is usually simply called "Bisbee". The district was named for an old reprobate, George Warren. George had been kidnapped by Apaches and lived with them for months before being rescued by white folk. How his name came to be attached to Arizona's most famous mining district is quite a story. Some of the following information was taken from the September-October 1981 *Mineralogical Record*, titled "Bisbee", authored by Richard Graeme, a former Superintendent of Mines at Bisbee.

The Warren district includes the famous Copper Queen mine and several other, equally rich copper mines in the Bisbee area. Luckily, a lot of old black-and-white photos exist, and I had a chance to see a lot that were taken over 100 years ago. My son Evan was doing research about the Warren mining district and was given permission to copy Bisbee-area photographs from an old album belonging to the Ben Williams family.

Ben Williams was the first mine manager of the Copper Queen mine. Ben and his brother Lewis were hired to open the Copper Queen property. San Francisco Judge DeWitt Bisbee was an investor in the venture. The Copper Queen was really the first successful copper mine in Bisbee, though it was soon followed by many other rich properties.

The Bisbee mines are famous for the huge quantity of fine copper species they produced. Oddly enough, however, the first mineral found in the Bisbee area was not a copper mineral, but a specimen of cerussite, a lead carbonate. It was picked



BEN WILLIAMS FAMILY PHOTO

Ben Williams was the man charged with developing the Copper Queen mine at Bisbee, Arizona, in 1881.

up in 1877 by Jack Dunn, one of a group of government scouts that was in the area due to the threat posed by local Indians. At the time, the area was called Mule Gulch after the nearby Mule Mountains.

Their duties prevented Dunn and two other scouts from filing claims on some rich outcrops of copper ore, so they teamed up with Warren, who agreed to file claims in his own name and the names of the three scouts. Warren, who was quite a rascal, filed the claims, but failed to include the names of the scouts!

The claims were initially developed for lead and silver, but were only marginally successful, as the ores played out fairly quickly. Remember, Tombstone was not that far away, so the big rush was for silver, not copper. As the lead and silver played out around 1880, speculators in San Francisco purchased the Copper Queen claims. Enter Ben and Lewis Williams. These boys were experienced miners who grew up in Swansea, Wales, where their father had worked at the metal smelters.

The Williams boys were sent to Bisbee to work the Copper Queen claims. Initial mining was done on an outcrop that was stained green by the copper salts within.

Few specimens from this outcrop exist today, but Ben's collection did have one. It is now in the Evan Jones collection of Arizona minerals.

The early ores, which were all secondary minerals like azurite, malachite and cuprite, had to be shipped to Swansea for smelting because there was no smelter in Bisbee. Imagine what it cost to haul ore by 20-mule team over the pass to the Gulf of California, load it on a ship, and sail it around the Cape Horn and across the Atlantic. These species were so high in copper content, however, that the investors could still earn a profit. Eventually, Lewis built a smelter and the rich ores were processed on site for a much greater profit. That put the Bisbee copper boom into full swing.

About a year after the Copper Queen mine development commenced, Dr. James Douglas was asked to check out the Atlantic claims, which were located alongside the Queen properties. Douglas's positive report resulted in development starting a year after the Copper Queen opened.

The ore body being worked in the Copper Queen just about ran out in 1884. The mining company was in dire financial straits and came close to closing down the mine. In fact, Ben was given orders to shut down, but with the last of the dynamite he had, he followed a hunch, changed direction underground, and shot off a blast that broke into a very rich ore body. The Copper Queen mine was able to continue working for nearly 100 years!

Ben and his company did not know it, but the underground mining operation at the Atlantic claims had broken into the same ore body, but from another direction. In Butte, Montana, when copper miners from one company broke into the ore body being mined by another company, an underground gun battle ensued. Fortunately, common sense prevailed in Bisbee; the owners of the Atlantic claims and the Copper Queen mine agreed to combine properties to form the Copper Queen Consolidated Mining Co. Everyone benefited as a result!

The people involved in this sensible union were all investors, one of whom was a man named Dodge, of Phelps Dodge Mercantile Co. If that name sounds familiar, it should, for Phelps Dodge became one of the great United States mining companies.

As mining continued, there were problems. Remember, the first ore body was not one continuous deposit. The Warren district ores formed pods and huge masses throughout the limestone, so when one had played out, it took some guesswork to find the next one.

Secondary ores, which were relatively easy to smelt, were the product of the weathering of sulfide ores. When mining ran into unweathered sulfide ore bodies, smelting became a real problem. Competition from other deposits, mainly in Upper Michigan, put such a squeeze on Bisbee that it barely survived. Bisbee's smelter, which was designed to handle secondary ores, had trouble competing, so a new smelting process was adapted. This was the Bessemer process, also used in steel production, which blasts air up through the molten ore, helping to break it down so that impurities can be removed. The Bessemer process is still in use today at many mines.

Most mining companies frowned on miners collecting specimens when they are being paid to recover ore. In fact, it is common practice at most mines to fire miners who help themselves to specimens. In mines where valuable metals like gold and silver are being mined, workers may even have to strip and change clothing before leaving the mine property.

The mine owners at Bisbee, however, looked the other way when miners carried fine specimens home. Tens of thousands of fine specimens were saved from the smelter that way. They ended up in the miners' china cabinets, on shelves or in boxes in the attic and cellar, and were sometimes forgotten about for years.

I was a party to a discovery that was made in a Bisbee attic back in the 1960s. Then-state mineral curator Arthur Flagg received a call from some folks in Bisbee who said they had found grandpa's mineral collection in the attic and the specimens were

going to be thrown out if no one wanted them. Flagg relayed the story to some of us in the Mineralogical Society of Arizona, and five of us journeyed to Bisbee and got the collection. Most of those specimens are still in the collection of the Mineralogical Society of Arizona.

There are plenty of old stories from the mines of Bisbee. The one that created the most news happened in 1917. In those days, unions were emerging, and one group was

Lavender Pit closed in 1974. However, it was impossible to seal off all the tunnel accesses, so local collectors who were familiar with the nearly 200 miles of underground workings could go in to collect, and were often successful. I once took a brief underground collecting trip, but was not very successful, gathering only a few small calcites. I simply didn't know where small pods of ore could still be mined.

Fine specimens of aurichalcite were one result; the underground caves held fine stalactites that were collected by rockhounds. Superb specimens of calcite crystals were often brought out, as well. It was really remarkable when rockhounds found new species, including graemite and rare claringbullite. One specimen of cuprite that was found by collectors is a gemmy, red crystal exceeding an inch in each dimension—an amazing size! This specimen has appeared on posters, on magazine covers, and in mineral exhibits in shows

around the world. Obviously, Bisbee still has something to offer.

Today, though mining still proceeds at Bisbee, the method used is environmentally ruinous: The company pumps acid-charged waters over the dumps and ore bodies. The acid leaches the copper out of the rocks and minerals. The copper-rich liquids are collected deep underground and pumped to the surface to be run through an electrolytic process to extract the red metal. 💎

Bob Jones holds the Carnegie Mineralogical Award, is a member of the Rockhound Hall of Fame, and has been writing for *Rock & Gem* since its inception. He lectures about minerals, and has written several books and video scripts.



In this early photo of Bisbee, the working smelter (center) and the original glory hole (the dark opening on the upper right) can be seen.



As the mines became successful, Ben Williams was able to own a lovely terraced home.

called the Industrial Workers of the World, or "Wabblies". During World War I, this group incited the miners in Bisbee to strike. Aghast, company officials and others, including an organization calling themselves the Loyalty League, put together a large group and, early one morning, grabbed more than 1,000 strikers and sympathizers, put them on a train, and shipped them to New Mexico.

My favorite story about Bisbee involves a bear. Before bottled and canned beer was available, folks went to the local bar with a bucket and brought home a draft to drink. One local watering hole had a pet bear chained to a tree outside. Sometimes, drinkers would stop and give the bear a sip from their bucket as they left the beer hall. One night, a little girl who had gone to get her father a bucketful left the bar without giving the bear his drink. The bear went after

her and accidentally killed her. Naturally, the townspeople were outraged and determined that the bear had to be killed. The bear unwittingly obliged by getting drunk, climbing into his tree, and falling asleep, then falling out of the tree and hanging himself on his chain!

The underground mines



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A 6.5 cm agate from Gawler Downs, Canterbury, New Zealand, in "The Agate Orphanage", a private collection that is open to the public by arrangement. Collected from an andesite outcrop on a farm. The banded opalite base is a common feature in agates from this farm.

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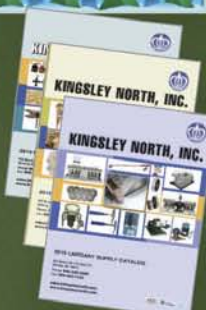


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